THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXX. No. 755.] LONDON, OCTOBER 30, 1877. [29th Year.] Price 6d.

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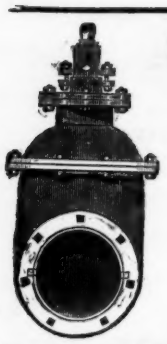
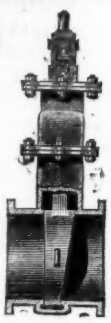


C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



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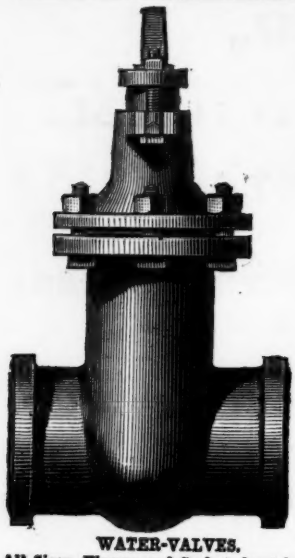

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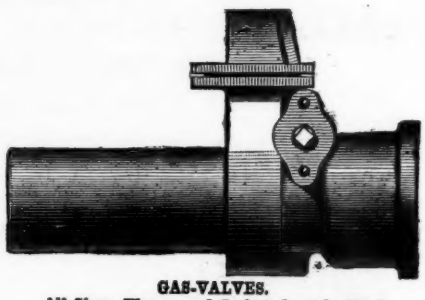

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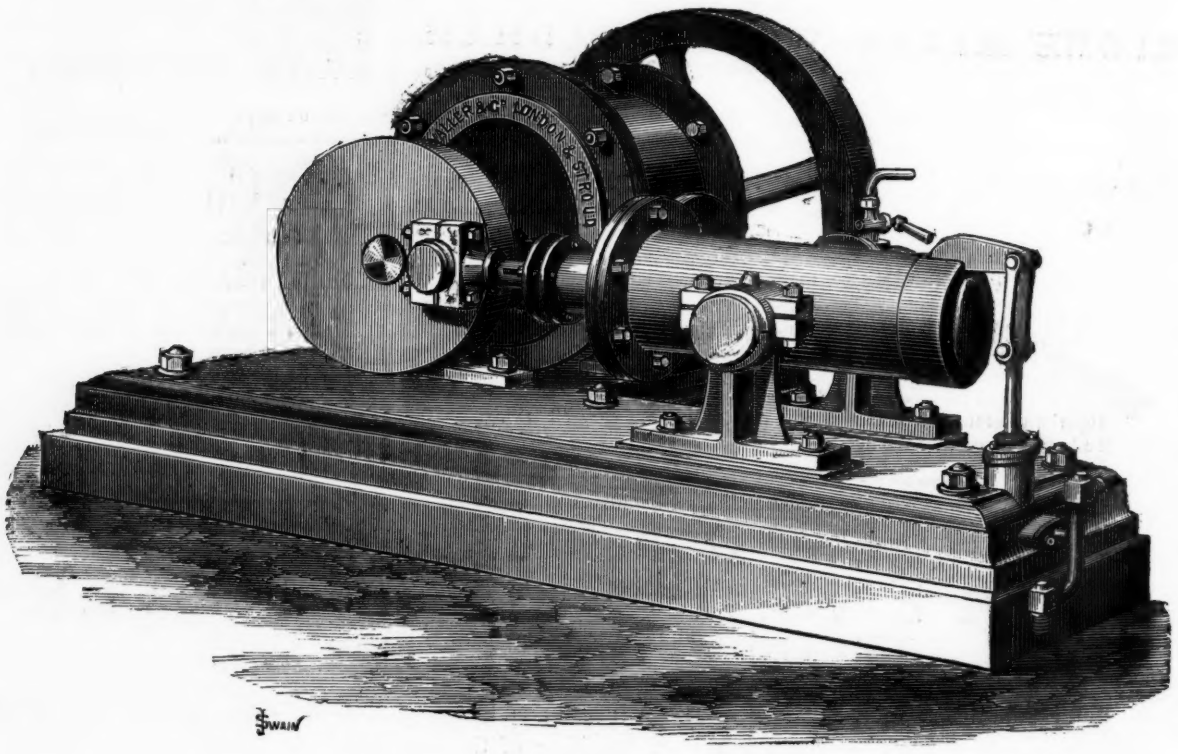

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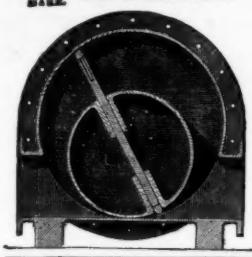

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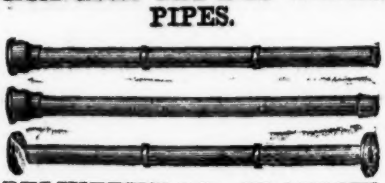

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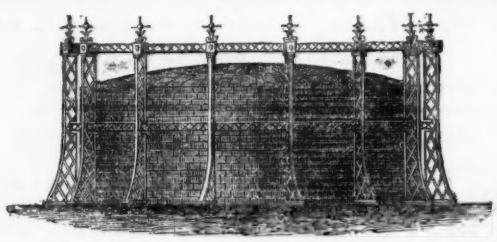

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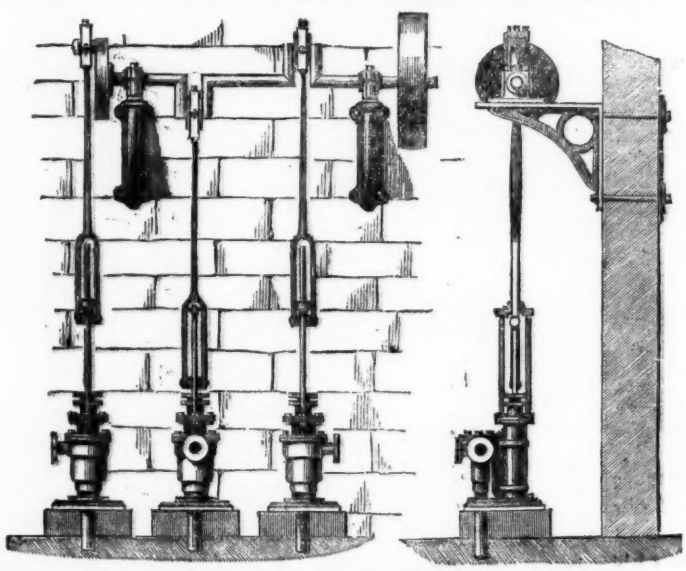

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For Water. For Tar. For Ammoniacal Liquor.
This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.
These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.
GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.
Illustrated Catalogues sent post free on application.

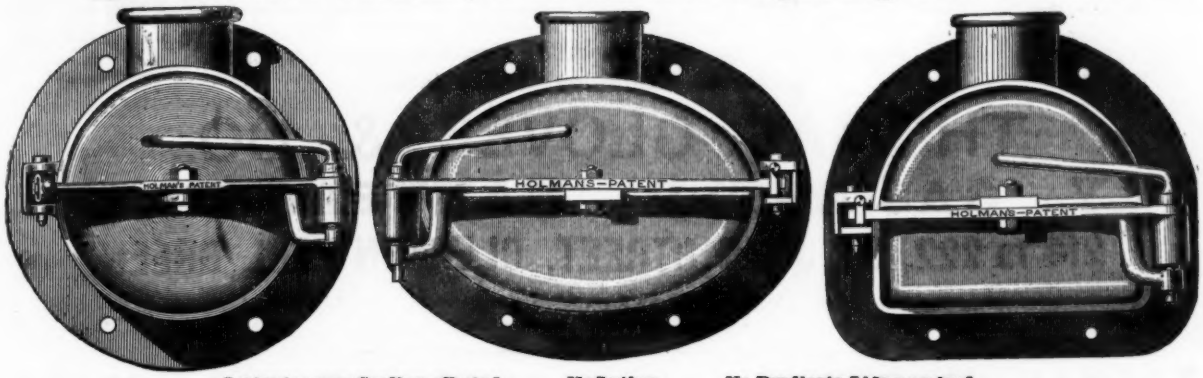
TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), being now in use in nearly all the principal Gas-Works in London and the Provinces.

Messrs. T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT ITSELF (see Illustrations above), instead of, as heretofore, bringing the Mouthpiece from the D or Oval at back to Circular in front.

D and Oval Morton's Lids have now been working satisfactorily for the past two or three years, both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

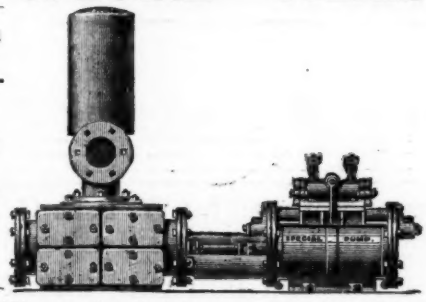
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

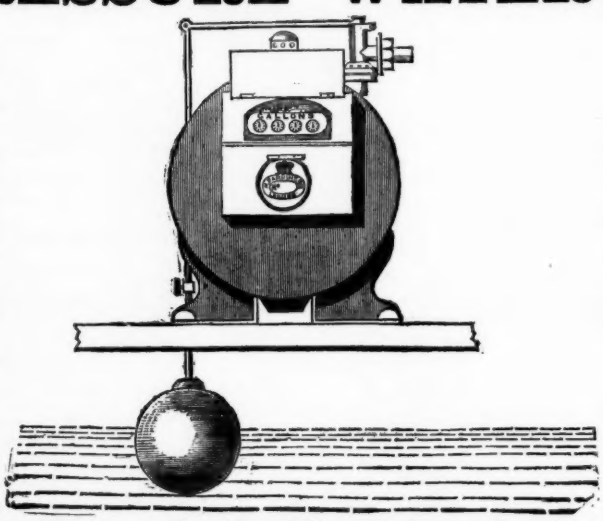
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co. for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

North of England Gas Managers Association.—*A report of the proceedings of the general meeting of this Association, held on the 27th inst., has reached us, and will appear next week.*

Manchester Corporation Gas Accounts.—*The annual statement will be published in our next.*

Several communications of interest, including a report of the proceedings at the Singapore Gas Company's meeting last week, are unavoidably held over.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 30, 1877.

Circular to Gas Companies.

The mineral statistics of the United Kingdom, which have just been published, present some points of much interest. The production of coal, notwithstanding the stagnation of trade, goes on increasing, and last year no fewer than 133,344,766 tons were raised. In 1875, 131,867,105 tons were produced, and it is noteworthy that the additional two million tons raised last year were exported. The change that has taken place in the value of coal is shown in the statement that the 133,344,766 tons raised last year were valued at only £46,670,661, while the 127,016,747 tons raised in 1873 were valued at £47,631,280. This change in the value of coal is, of course, beneficial to the interest of Gas Companies, while it testifies to a depression of our other manufacturing industries, and, if it continue, must lead to serious consequences. There are, however, signs of a revival, and it is doubtful whether the coal contracts for next year will be made on such favourable terms as obtained this year. The returns we quote from show that the manufacture of iron, notwithstanding the stagnation of trade, considerably increased during the last year, but evidently without an improvement in the rate of profit. Both coal and iron seem to us to have reached their lowest rates last year, and we have now, we hope, to look forward to improvement, which, if in some respects detrimental to Gas Companies, must tend to the advantage of the general community.

We report at considerable length, in other columns, the case of the Metropolitan Board of Works against the Commercial Gas Company, heard at the Worship Street Police Court. The decision was against the Company, who were fined £400, and they have only themselves to blame for it. They ought to have appealed to the Chief Gas Examiner; but having failed to do so, the penalty followed as a natural consequence. Nevertheless, there is much that deserves serious attention in the points urged by the Company, which, if put forward before the Chief Gas Examiner, would, in our opinion, have had overwhelming force. In the first place, it is quite clear that, under the terms of the Company's Act, they could only be fined for an excess of ammonia on an average of three days. If, in this case, such an average had been struck, it would appear that the offence complained of would have only been committed on six days, instead of eight, for which the Company have been fined. The wording of the section is very distinct: "The average of all the testings of purity prescribed under this "Act on three successive days shall be deemed to represent the "purity on each of such days." Now, it is perfectly clear that the terms of the Act are not complied with when the Company are fined for excessive impurity on one day, without reference to the amount of the two preceding days, and, in our opinion, want of attention to this point vitiates the whole proceedings in this case. The law says, the Company shall be fined for excess of impurity on an average of three days. The Commercial Company have been mulcted for excesses on single days, and thus they have good grounds for appeal, and we can hardly see how the Magistrate can refuse to grant a case. There is another point of importance, not so much in regard to impurity as to a deficiency of illuminating power. The Act provides that, if the gas is found defective in any particular, the Gas Examiner shall *forthwith* give notice to the Company. The object of the Legislature was, that the Company should receive immediate notice of any defect, in order that, if remediable, the defect should be at once removed. The terms of this section are certainly not complied with when the ordinary return, provided for by the Act, is sent by post to be delivered on the following day. It appears to us that the plain duty of the Gas Examiner is, as soon as he finds any defect, to go straight to the works with a written information. With regard to the three days average, it seems to us that, with a view to render proceedings strictly legal, according to this and the corresponding Acts, the return prescribed by the Referees should have two additional lines, in which should be set out the average amount of the impurities, calculated for three consecutive days. On the grounds urged by their advocate, we believe the Company have just cause of complaint, but we fear they are barred by their unaccountable neglect to appeal to the Chief Gas Examiner. They have received a lesson, by which, we hope, they will profit. As to any mitigation of the penalty, it would appear that, under the terms of the statute, the Magistrate had no option but to inflict to the full amount. It would seem strange that the words "not exceeding" do not find their place in the penal clause; but the explanation, probably, is that the Legislature, having given the Company the right of appeal to the Chief Examiner, before whom excuses for defects could be alleged, considered the absence of appeal a confession of unmitigable guilt. We draw particular attention to this point, because, in the course of a few years, other Metropolitan Gas Companies will be brought under similar legislation, and we hope that in future Acts explicit power will be given to Magistrates to reduce the penalty, if sufficient reason for so doing can be shown.

The long-pending case of the South Metropolitan Gas Company against the Rev. R. O. T. Thorpe has been ended by a decision of the Magistrate that the reverend gentleman should pay the charge made by the Company. The accuracy of the meter was established beyond dispute, and the most likely explanation of the apparent excessive charge was an error made by the inspector who read the meter-index for the previous quarter. Mistakes of this kind are not uncommon. The inspectors examine the indexes in a rather perfunctory manner, and, skilled as they are in their occupation, they are liable to make mistakes. In this case a good deal of heart-burning has been occasioned, much of which might have probably been allayed if the Company had adopted a different course when the dispute first arose. It is too much the habit of Gas Companies to endeavour to carry things with a high hand, and we are continually receiving complaints which, no doubt made, for the most part, on insufficient grounds, show a feeling of irritation on the part of consumers, for which there is some cause. A letter signed "A Victim," which we received this week, but do not publish, gives an instance in which a Gas Company, acting strictly on

their legal rights, nevertheless inflicted a gross injustice on the consumer.

The letter of Mr. M'Gilchrist respecting gas affairs at Dumbarton, which we publish in another column, corrects one mistake which we made, and which was the result of a clerical error, but does not in other respects affect the accuracy of our remarks. A reference to the list of Gas Companies which we published in 1873 will show that the £5 shares of the Dumbarton Gas Company were at that time fetching £16 10s., and that the Company were paying a dividend of twenty per cent., a rate of dividend which would justify the price of the shares. What dividend the Company paid in the last days of their existence we never heard until this letter reached us. That the Company and the Corporation lost money by selling gas at 4s. 7d. in 1873 we can readily believe. Mr. M'Gilchrist does not deny that the Corporation raised the price at one bound to 6s. per thousand—for which we do not blame them—nor does he deny that, by three successive reductions, the Corporation have once more brought down the price to that charged by the Company in the difficult times of 1873. It is far from our intention to criticize, in any hostile spirit, the management of gas undertakings by Corporations. As regards Scottish undertakings in particular, we are continually pointing out that they are almost universally managed for the benefit of consumers, and not for the benefit of the rates, and of this Dumbarton is an illustration.

Without entirely agreeing with Mr. Lewis Thompson Wright as to his chemistry, we may remark that his letter contains much suggestive matter, which well deserves attention. When the revivification of lime for purifying purposes, and the most perfect utilization of residuals, are considered, there are points in this letter which will deserve attention. We are very sorry that Mr. Wright has not time to recalculate his father's tables on M. Regnault's data, but the formula he gives is welcome. For our own parts, we may say that our efforts to recover bisulphide of carbon from fouled lime have been futile. The extent of the solubility of the vapour of naphthaline in the vapours of other hydrocarbons will, we fear, for ever remain a vexed question.

A courteous letter from M. Brémond gives some further information as to his process for preventing the deposition of naphthaline in mains and pipes. He still uses words which imply the reproduction of naphthaline after the desiccation of the gas, in which, of course, we do not believe. On most other points, as set forth in this letter, we are at one with M. Brémond; but we may just remark, that a thoroughly desiccated gas would quickly become saturated with aqueous vapour when in contact with water. Every gas or vapour is as a vacuum to another, and contact with water, for a short space of time, would be sufficient to contribute a large amount of aqueous vapour to the gas. To our minds, M. Brémond's process will be most effectually applied after the purifiers. From that point the naphthaline would probably be carried on without the risk of deposition, except under very special circumstances.

The Corporation of Manchester have resolved on the following reductions in the price of gas:—Within the city from 3s. 4d. to 3s. per thousand feet, without the city from 3s. 10d. to 3s. 6d., and from 4s. 6d. to 4s. beyond the River Mersey and the district of New Mostyn; the reduction to take effect on the 1st of January next.

When, last week, we noted, with regret, that the Arbitrators between the Birmingham Corporation and the outlying Local Authorities were sitting with closed doors, and observed that the precedent set might be of importance to other Authorities and Corporations, we had forgotten the fact that the Leeds Improvement Act, referred to in another column, authorizes the sale of portions of the Corporation gas undertaking to outlying Sanitary Authorities. The day can hardly be distant when the authorities around Manchester, tired of paying ten per cent. for the exclusive benefit of the city of Manchester, will desire to have gas-works of their own, and, as we said before, it is desirable to know on what principle fragments of gas undertakings are to be valued.

The results of the average meter system in Lambeth, from an imperfect report before us, appear to have been satisfactory. The Vestry, after having deducted all the incidental expenses, claim to have saved the sum of £293 4s. The amount is not great, but if a good feeling is established between the Gas Company and the Vestry, a very satisfactory result will have been obtained. The report which we publish in another column shows that the result of the average meter system in the parish of St. Pancras has been likewise satisfactory, it being alleged that the total saving for the year is £2533.

Gas affairs at Halifax have assumed a rather curious phase. As we said last week, a majority of the Town Council have resolved upon reducing the price of gas 4d. per thousand feet. To this course the Mayor is opposed, he proposing a reduction of 2d. on the borough-rate, and 2d. on the price of gas. The finances of the Corporation of Halifax are evidently not in a satisfactory state, the estimates of the year showing an acknowledged deficiency which could hardly be made good if the price of gas were continued at its present rate, and the gas consumers of the borough taxed to supply the deficiency. How this deficiency arises is not quite clear to us; but, taking our stand on sound financial principles, we venture to affirm, in the language of the late John Stuart Mill, that every rate imposed by a local authority should be equal to discharge the obligations for which the rate is imposed. This principle well borne in mind, there ought to be no such thing as a deficiency in municipal finances. The charge for gas should defray all the expenses incidental to the undertaking, the police rate should pay all the expenses of guarding the inhabitants of the borough, and, speaking generally, all other items of expenditure should be sufficiently provided for. We shall be sorry if this gas dispute cost the borough of Halifax the services of its present Mayor, but, nevertheless, shall be pleased to see the finances placed on a sounder basis than they rest upon at present.

We continue to-day our report of the recent meeting of the West of Scotland Association of Gas Managers. It will be seen that a very interesting discussion followed the reading of Mr. Sugg's paper on his "Illuminating Power Meter." The merits of this instrument were fully appreciated, and the objections to it were fairly stated. We have no occasion here to enter into the discussion, but must express an opinion that, employed under proper conditions, it would be of the greatest service to Managers as a guide in the manufacture of gas. So far as the legal testing of gas is concerned, we adhere to the opinion always maintained in these columns, that sperm candles, imperfect as they may be, offer the best means of comparison.

We have to thank Mr. Young for a careful tabulation of the results obtained by his brother-in-law, Mr. Cusiter, in his examinations of coals for gas-making purposes. The discrepancies between the illuminating power, the condensation, and the duration tests were very early observed, but the reasons are not even now known with certainty. Supposing gas perfectly purified, those containing the largest amount of condensable hydrocarbons ought certainly to exhibit the highest illuminating power, and the duration of the flame should be proportionate. Many of the differences observed by Mr. Cusiter were, no doubt, due to variations in the candles, and to the presence of diluents in the gas, not easily recognized. Apart, however, from any standard of comparison, the duration test affords a valuable means of estimating the quality of a gas, and in these days it is, perhaps, too much neglected.

Just as we go to press we receive intelligence of the amalgamation of the three Gas Companies supplying the city of Melbourne, Australia. In our next we shall be able to give the details of these arrangements, which have been unanimously resolved upon by the Companies, and which appear, from the tone of the colonial press, to meet with public acceptance generally. The principal provisions appear to be, that the capital of the united Company (to be called the Metropolitan Gas Company) shall consist of the sum of £555,000, in 111,000 shares of £5 each, with power to increase to £1,000,000; the shareholders in the Melbourne Company to receive 63,000 shares, the Collingwood Company 35,000 shares, and the South Melbourne Company 13,000 shares. In the interests of the consumers, it is stipulated that while the price of coal, delivered at the works, does not exceed 30s. per ton, the maximum price of gas, of fourteen-candle illuminating power, shall be 7s. 6d. per 1000 cubic feet. Provision is also made for the appointment of Gas Examiners and Meter Inspectors. Power is to be given to any Metropolitan Board of Works, hereafter constituted, to purchase the property of the united Company.

Bradford Corporation New Gas-Works.—At the last meeting of the Bradford Town Council the Gas Supply Committee recommended the purchase of about 40 houses, besides land, &c., required to make room for the proposed new gas-works at Laister Dyke, which are to be on a very extensive scale, and which, when completed, will replace the present ones in the centre of the town. The old premises will then be pulled down and the land sold. It is expected that the site, &c., will realize a sum which will go a long way towards paying for the larger new works.

Gas-Works at St. John's, New Brunswick.—From a Glasgow correspondent we learn that in the course of the dreadful conflagration, which took place some time ago at St. John's, New Brunswick, the gas-works of the town were completely destroyed, and that the gas company's loss amounts to upwards of 60,000 dols., exclusive of the loss of about 800 customers. It is believed that no town of the same population ever suffered by fire so severely as that of St. John's did during the short period of six hours over which the fire in question raged. The gas company are already engaged in the rebuilding of their works under contract with a United States firm, all the materials, skilled labour, &c., required being obtained from the States. They were somewhat confident that they would again be in a position to supply gas to their consumers by the 1st of November.

Water and Sanitary Notes.

THE Annual Report of the Local Government Board, a summary of which we publish in another place, shows that the water supply of the Metropolis is extending and improving. Something, no doubt, remains to be done to make this supply what it might be; but it must be admitted that the Companies are doing their best to comply with the somewhat exacting demands of the purists. Some of the Thames Companies are expending large sums of money on subsiding reservoirs and extensive filter-beds, so that the water they furnish may be free from the accusation of turbidity, which means an infinitesimal proportion of clay suspended in the water, and of living and moving organisms difficult to discover by a microscope of high power. The benefits of a constant supply have not yet been granted to any district south of the river, excepting that of the Kent Company. By this Company, and also the East London and New River Companies, it has been continually extended, and, with the hearty co-operation of Local Authorities, the change of system might progress more rapidly. It is satisfactory to see that the number of hydrants fixed has been nearly doubled in the course of the past year. These important aids to the extinction of fires may not have the value they would have if the water was supplied at a higher pressure; but, as they are, they constitute a great improvement on the old-fashioned plugs. Whether or not we shall have the high-pressure system, recently suggested, we have yet to learn. Contrary to our expectation, the Metropolitan Board were silent on the subject at their last meeting.

A few householders in Birmingham object to have their wells closed. They say that they would not oppose the closing, if the water in the well was proved to be unfit for use; but they contend that, in many, it is perfectly wholesome, and when this is the case they do not see why they should be compelled to take the Corporation water. As a rule, the water from town pumps is to be suspected; and, although we do not believe that any harm has resulted from the imbibition of the water, it would be best for them to be closed. There is, however, one well which certainly ought to be closed. It is at Clarkston, and the water is thus reported on by the local analyst: "As drawn "from the pump, this water had a decided black colour, a "strong repulsive odour of decomposing organic matter, and a "taste so nauseous as to be undrinkable." It seems that the unfortunate inhabitants have to pay for this water. The supply of wholesome water to our rural populations is one of the most pressing questions of the day, and we hope it will soon engage the serious attention of the Legislature.

That there are stupid people in the world everybody has reason to know, but that there are people so stupid as not to be able to make a charcoal filter appears almost inconceivable. It seems, however, that a Rural Sanitary Authority in Derbyshire decided on filtering their sewage through charcoal, and this is the result, as described by their Medical Officer of Health: "The effluent "water, after treatment with charcoal, was as black and foul and "offensive in smell as the raw sewage." Now, everybody knows that charcoal, properly used, is a most efficient filtering medium. We are not told what charcoal was used. If it were some of the kinds advertised, we can easily believe that but little benefit would be derived from its use; but, at the very worst, a properly made filter-bed ought to remove suspended matter.

The canalization of our thoroughfares can hardly be said to be completed. We have, at the present moment, under our roadways and pavements, gas-pipes, water-pipes, and telegraph wires, not to speak of sewers and drains. It is now seriously proposed that, with a view to lessen the impurities of the air, most of which it is said, in Manchester, are contributed by small boiler furnaces, large central works shall be established, and power, distributed either by compressed air or water under high pressure, carried under the streets. Professor Osborn Reynolds seems to think this a reasonable plan, but we much doubt whether it will ever be realized.

GAS SUPPLY OF HIGHBRIDGE.—New gas-works are in course of erection at Highbridge, Somerset, the contractor for their erection being Mr. Willey, gas engineer, of Exeter. The works will cost about £3000.

PORTSEA ISLAND GAS COMPANY.—The introduction of West's system of charging and drawing retorts at these works took place on the 22nd inst., in the presence of a numerous company, invited by Mr. Douglas, the manager. Previous to witnessing the first operation of the new method, the visitors were conducted over one retort-house, to see 14 retorts drawn and charged in the ordinary manner. The improved system was explained to them by Mr. F. W. Hartley, and its application to 12 benches of 12 each through retorts was then witnessed with much interest. The company afterwards sat down to supper in the manager's room—Mr. Douglas presiding. The Mayor and the Vicar of Portsmouth, several directors of the gas company and of West's Gas Improvement Company, were among the guests. A very favourable opinion appeared to be entertained, from what had been seen, of the new system, and hearty good wishes were expressed for the success of this trial of its merits on a large practical scale.

GAS LEGISLATION, 1877.

(*Continued from page 637.*)

THE nine Acts authorizing Local Authorities to purchase gas undertakings are as follows:—

The *Blackburn Borough Gas, Water, and Extension Act* is, *inter alia*, to enable the Corporation of Blackburn to acquire the undertaking of the Blackburn Gas Company. The consideration to be paid is perpetual annuites of ten per cent. on two classes of shares entitled to that amount of dividend, with a bonus of £2 on each share. An annuity of seven and a half per cent. on another class of shares entitled to a like amount of dividend, also with a bonus of £2 per share; and a perpetual annuity of seven per cent. on the C shares, on which only £5 have been called up. The bonus on this last class of shares is to be £3 10s. The transfer is to take place on the 31st of December, at which date the Corporation will assume all the debts of the Company. Half the reserve-fund is to remain in the hands of the Company, to be applied as the Directors may think fit. The Corporation are to supply sixteen-candle gas, the maximum price being that fixed by the Company's Act. Power is given to borrow such sums as may be required for gas purposes other than the payment of annuities; but there is a further provision that the Corporation may borrow any other sums of money for the redemption of annuities at twenty-five years purchase. A sinking-fund may be formed for the same purpose.

The *Burslem Local Board Gas Act* is to enable the Burslem Local Board to purchase the gas undertaking of the Burslem and Tunstall Gas Company. The consideration to be paid is a lump sum of £80,000. The transfer was supposed to have taken place on March 31, 1876, since which date the Company have carried on the concern at the risk of the Local Board. The purchase was to be completed on Sept. 30 last, up to which date the Board were to pay interest to the Company on the purchase-money at the rate of five per cent. The Board, of course, assume all the debts of the Company. The officers are to continue in service until removed by the Local Board. The Local Board are to supply gas of fourteen-candle power, at a maximum price of 4s. per thousand, subject to a discount of twelve and a half per cent. for prompt payment. Money received on deposit as security is to bear interest at the rate of five per cent. per annum. The Act gives the Board power to borrow on mortgage the amount required for the purchase, and a further sum of £20,000 as it is required. The money may be raised by the issue of debentures or annuities, under the provisions of the Local Loans Act, 1875. Net profits, after providing for the formation of a reserve-fund of a limited amount, and all other charges, are to be carried to the district-fund. The money borrowed is to be paid off, either by instalments or by means of a sinking-fund, within a period of sixty years, and the usual annual return is to be made to the Local Government Board.

The *Colne Gas Act* is to authorize the acquisition of the Colne Gas Company by the Colne and Marsden Local Board. The Company (non-statutory) have expended on the undertaking the sum of £13,500. The consideration to be paid by the Local Board is £32,000, which is just about twenty-three years purchase of a ten per cent. dividend on the expended capital. The Local Board are to supply gas of fourteen-candle power, at a maximum price of 5s. The Board have power to raise, as required, a sum not exceeding, on the whole, £45,000, which is to be paid off by means of a sinking-fund or otherwise, within a period of fifty-five years. The loans may be raised under the conditions of the Public Loans Act or not, as the Board may think fit. The surplus profits of the undertaking are to be carried to the district-fund. The Act authorizes the sale of that portion of the undertaking which lies within the district of Trawden to the Sanitary Authority of that district, who are expressly forbidden to supply gas unless they effect this purchase.

The *Dukinfield and Denton Local Boards (Gas) Act* is to authorize the joint purchase by the Local Boards of Dukinfield and Denton of the undertaking of the Dukinfield Gas Company. The Company have expended capital to the amount of £30,000, and the consideration is ten per cent. annuities on this sum. The Boards have to supply fifteen-candle gas, tested by a fifteen-hole Argand, or other approved burner. The maximum price of gas is to be 5s. per thousand, but it is provided that the price actually charged shall be determined by an estimate calculated to yield a net profit of seven per cent. Discounts are to be allowed according to consumption. Each Board obtains power to borrow the sum of £20,000 in addition to that required to pay the expenses of this Act, and also a sum calculated to pay off the annuities at twenty-five years purchase. As is usually the case with joint purchases, the financial arrangements are somewhat complicated, and are only of local interest.

The *Longton Gas Act* is to authorize the transfer of the under-

taking of the Longton Gas Company to the Corporation of Longton. The expended capital of the Company is £40,000, of which one-half is entitled to a dividend of ten per cent., the remainder to seven, and the Company have a mortgage debt of £3150. The consideration to be paid for the undertaking is a lump sum, in cash, of £73,150. For the purposes of this Act, the Corporation get power to borrow £100,000. The quality of the gas remains the same as fixed by the Longton Company's Acts. The maximum price of gas supplied by the Corporation by meter, except within the borough of Longton, and within a radius of one mile from the works of the Company, is not, from and after the 1st of January, 1880, to exceed 4s. per thousand, and the price to be charged by the Corporation for gas supplied by them within the one mile radius, shall at all times be the same as that charged within the borough. Surplus profits, when amounting to £5000, will be carried to the borough-fund. The money borrowed is to be paid off by means of a sinking-fund, or otherwise, within a period of seventy years.

The *Maryport District and Harbour Gas Act* is to enable the District and Harbour Trustees of Maryport to complete the purchase of the Maryport District and Harbour Gas Company, the terms having been settled by arbitration, under the provisions of an Act passed in 1869. For the purposes of this Act, the trustees get power to borrow, as may be required, a sum not exceeding £20,000, at a maximum rate of interest of five per cent. Gas of fourteen-candle power is to be supplied, and the price within the township of Netherhall is not to exceed 4s. per thousand, and outside 5s. The trustees have power to supply public lights, as well as hospitals and institutions supported out of the rates, gratuitously. Surplus profits of the undertaking may be applied to increase the district-fund. If the gross profits of the undertaking are insufficient to pay the charges on it, the trustees may levy a gas-rate, but no such rate can be levied if the charge for gas be less than the maximum price allowed by this Act.

The *Newcastle-under-Lyme Gas Act* is to extend the boundaries of the borough, and enable the Corporation to acquire the undertaking of the Newcastle-under-Lyme Gaslight Company on giving due notice within three years from the passing of this Act, on terms to be settled by agreement or arbitration. The Act gives the Corporation power to borrow, under the provisions of the Local Loans Act, 1875, any sums which may be required to complete the purchase of the undertaking. When the purchase is completed the Corporation shall supply fourteen-candle gas at the maximum price of 4s. 3d. per thousand within their limits. The money borrowed for gas purposes is to be paid off, by means of a sinking-fund or otherwise, within sixty years.

The *Ramsgate Local Board Act*, among other things, authorizes the Local Board to acquire the portion of the Isle of Thanet Gas Company lying within their limits. The terms on which this purchase is effected have been so recently put before our readers, that they need be only shortly referred to here. The amount of purchase-money is £65,000, together with £1531 for the stock in hand. The purchase-money amounts to just about twenty-three years purchase of a ten per cent. dividend on a capital of £12,000, and expended profits capitalized to the extent of £16,000. (See Isle of Thanet Gas Act, *ante*, p. 637.) The Local Board have power to borrow £80,000 with respect to the gas undertaking. Gas of fourteen-candle power is to be supplied, at a price not to exceed 5s. per thousand. It is noteworthy that the standard price at Margate (subject to the sliding scale) is only 4s. 2d. per thousand. Surplus profits are to be applied one-half in reduction of price to the gas consumers, and one-half to the district-fund.

The *Warrington Gas Act* is to empower the Corporation of Warrington to acquire the undertaking of the Warrington Gas Company. The Company have raised and expended share capital to the amount of £64,800, and have borrowed to the extent of £5350. The consideration to be paid is a perpetual annuity of £3600, equal to ten per cent. on the 1800 £20 shares fully paid up, and £2520 on 3600 shares on which £8 has been paid up, equal to about nine per cent., and a bonus of 10s. in respect of each share. The Corporation may at any time, by agreement, redeem the annuities at twenty-five years purchase. Power is given to borrow £200,000 in respect of the undertaking, which amount has to be paid off by means of a sinking-fund or otherwise within fifty years. The quality of the gas is to be of sixteen-candle power, and the maximum price within the borough is to be 4s. per thousand, with small increased rates for outlying districts.

The four Acts conferring additional powers on Corporations in respect of their gas undertakings are as follows :—

The *Bolton Improvement Act*, among other things, extends the limits of the gas supply of the Corporation, and authorizes them to borrow £100,000 for gas purposes.

The *Dundee Gas (Additional Powers) Act* authorizes the Dundee Gas Commissioners to construct additional works, for which purpose they obtain power to borrow a sum, or sums, not exceeding £100,000.

The *Leeds Improvement Act* authorizes the Corporation to improve and extend their gas-works, and for this purpose confers power to borrow £300,000. In this Act, as in that of the Birmingham Corporation, outlying Sanitary Authorities are empowered to purchase such portion of the Leeds undertaking as lie within their limits, the price being settled by agreement or arbitration.

The *Middlesbrough Improvement Act, inter alia*, enables the Corporation of Middlesbrough to acquire certain lands, and to construct additional gas-storeage works, gasholders, and other works for the storeage of gas, residual products, and other matters. For this purpose the Corporation obtain power to borrow £80,000.

We may mention that all these Acts require the several Corporations to pay interest on deposit of moneys received by way of security for gas and meter rents. They give the option of borrowing under the Local Loans Act, 1875, and they require the usual return to be made to the Local Government Board relative to the paying off of debts by means of a sinking-fund.

The *London Corporation Act* is a nondescript measure, and seems to have been obtained to make assurance doubly sure, by re-enacting that the remuneration of the Chief Gas Examiner and Auditor appointed under the provisions of the City of London Gas Act, 1868, and the Chartered Company's Act, shall be paid by the Company. It also shifts the payment of the salaries of the local City Examiners from the Corporation to the Commissioners of Sewers.

PROVISIONAL ORDERS, 1877.

The following Provisional Orders, granted by the Board of Trade, under the Gas and Water Facilities Act, 1870, were confirmed by special Acts passed in the last session of Parliament :—

The *Abingdon Gas Order* confers *quasi* statutory powers on the Abingdon Gas Company, Limited. The original capital of the Company is £10,000, and this Order gives them power to raise additional capital to the same amount. The new capital is, of course, to be offered by auction or tender. Gas of fourteen-candle power is to be supplied, at a price not exceeding 6s. 8d. per thousand cubic feet. The dividend on the new capital is to be seven or six per cent., according as it is raised by ordinary or preference shares. The sliding scale is not prescribed.

The *Brotton Gas Order* is granted to the Brotton Gas Company, Limited, a new Company formed to supply gas to the township of Brotton. The capital of the Company is to be £15,000. The usual power is granted to purchase land by agreement, and to erect and maintain gas-works thereon. Gas of fourteen-candle power is to be supplied, at a maximum charge of 6s. 6d. per thousand feet.

The *Cranleigh Gas Order* empowers the Cranleigh Gas Company to maintain and continue gas-works for the supply of Cranleigh and the neighbourhood. The original capital of the Company amounts to £4000, and this Order confers power to raise another £4000 of capital, the dividends on which latter sum are limited, as usual. Gas of twelve-candle power is to be supplied, at a maximum price of 8s. 6d. per thousand feet. The new shares are to be offered by auction or tender, but the sliding scale is not prescribed.

The *Guisborough Gas Order* is granted to the Guisborough Gas Company. The capital of the Company is to be £15,000, and no additional sum can be raised without further authorization. Fourteen-candle power gas is to be supplied, at a maximum price of 6s. per thousand.

The *Horsham Gas Order* empowers the Horsham Gas Company, Limited, to carry on their undertaking with the usual privileges and responsibilities. The original capital of the Company is £15,000, and this Order gives them power to raise a like sum. The new capital is to be offered by auction or tender, and the dividend is limited to seven or six per cent., according as it is issued. Gas of fourteen-candle power is to be supplied, at a maximum price of 7s. 6d. per thousand feet.

The *Mansfield Gas Order* authorizes the Mansfield Gas Company to raise additional capital to the amount of £12,000, and to borrow in respect of it to the usual extent. The new shares are to be offered by auction or tender, but in this, as in the preceding cases, Lord Redesdale's last Standing Order does not apply. The dividend on the new capital is to be limited as usual.

The *Newcastle-under-Lyme Gas Order* authorizes the Newcastle-under-Lyme Gas Company to raise additional capital to the extent of £6000, and to borrow £1000 in respect of the existing capital, and £1500 in respect of the additional. The new shares are to be offered by auction or tender, and the dividends to be

restricted as usual. As the undertaking will probably soon pass out of the hands of the Company, we need not notice the further provisions of this Order.

The *North Camp and Farnborough Gas Order* is granted to the North Camp and Farnborough Gas Company, supplying a district in the neighbourhood of Aldershot. The present capital of the Company is £20,000, and by this Order the Company get power to raise an additional £10,000, the dividends on which are limited as usual. The new shares are, of course, to be sold by auction or tender. Gas of fifteen-candle power is to be supplied, at a maximum price of 7s. per thousand.

The *Pickering Gas and Water Order* fixes the capital of the Pickering Gas and Water Company, Limited, at £10,000, and enables them to acquire additional lands for their gas undertaking. The quality of the gas is to be of fourteen-candle power, at a maximum price of 7s. per thousand cubic feet; but it is provided that if the price exceed 5s., the Local Board of Pickering may interfere, and refer the matter to arbitration under the provisions of the Public Health Act, 1875.

The *Southbank and Normanby Gas Order* confers further powers on the Southbank and Normanby Gas Company, Limited, who are authorized to raise additional capital to the amount of £40,000. Subject to the sliding scale, which is prescribed in this Order, the dividend on the original capital is limited to ten per cent., and that on the additional to six or seven per cent., according as it is raised. The illuminating power of the gas is to be fourteen candles, and the standard price 5s. per thousand.

Three Provisional Orders were granted by the Local Government Board to Local Authorities, under the provisions of the Public Health Act of 1875.

The *Penrith Gas Order* is to enable the Local Board of Penrith to purchase the undertaking of the Penrith Gaslight and Coke Company, Limited; and for this purpose to borrow, with the consent of the Local Government Board, such sum as may be required, which is to be paid off by instalments, or by means of a sinking-fund, within sixty years. The Local Board are to supply gas of fourteen-candle power, at a price not to exceed 6s. per thousand. If the price of gas does not exceed 4s. per thousand, surplus profits may be applied to the district-fund; but if such profits are realized with a higher rate, they must be applied in reduction of price.

The *Silsden Gas Order* authorizes the Local Board of Silsden to buy gas in bulk, and distribute it within their district at a price not to exceed 6s. per thousand. The Order provides that the Board shall distribute gas of the same quality they receive. If any deficiency of revenue occur when the maximum price is charged, it may be made good out of the district-fund, to which fund surplus profits may be carried when the price does not exceed 4s. Any surplus profits when the price exceeds 4s. shall be devoted to a reduction.

The *Ynyscynhaiarn Gas Order* authorizes the Local Authority of the district bearing this name to purchase the undertaking of the Portmadoc Gas Company, Limited, at a price to be agreed upon. Gas of fourteen-candle power is to be supplied, at a price not exceeding 8s. 6d. per thousand. The public lights are to be supplied on the average meter system, and the price charged for them not to exceed that charged to private consumers. Surplus profits may be applied to the district-fund, and if any deficiency of revenue occur when the maximum price is charged, it may be made good out of a district-rate. The Local Board, of course, get power to borrow with the sanction of the Central Authority.

In all the Orders above named the testing clauses of the Act of 1871 are incorporated. Companies and Local Authorities alike are required to pay interest on deposits—the rate of which, in those granted by the Local Government Board, is limited to four per cent.—or, if the money be invested in Government securities, at the rate the Board receive.

Purchase of the St. Helen's Gas-Works.—At the meeting of the St. Helen's Town Council, on Thursday last, the town-clerk was instructed to make application to the Local Government Board for their sanction to the corporation borrowing £13,000, in addition to the £150,000 already applied for, on account of the purchase of the gas-works, and for future extensions and improvements.

Sales of Gas and Water Shares.—During the past week 24 fully paid-up shares (£1 each) in the Falmouth Gas Company were offered for sale by auction, and after a brisk bidding were knocked down at 41s. per share. On the 24th inst. 450 £1 shares in the Bromsgrove Consumers Gas Company were sold in that town. Three hundred were sold by auction, in lots of 25 each, and realized on the average 38s. 10d. each, the remaining 150 were sold by private contract at 39s. per share. At the Auction Mart on Wednesday last, part of a King's freehold share in the New River Company was sold in three lots, at the rate of £97,200 per share. There were also sold 63 new £100 shares, paid up, in this corporation, for £17,985, or at the rate of about £285 per share. At a sale in Lincoln on the 19th inst., £290 of £5 per cent. Preference Stock in the Lincoln Gas Company, sold at 10½ per cent. premium, and a new £50 share in the same company was sold for £76 10s.

THE SIXTH ANNUAL REPORT OF THE LOCAL GOVERNMENT BOARD.

The Sixth Annual Report of the Local Government Board (1876-77), laid before Parliament during the last session, has just been published. It is divided into two parts—the first dealing with the proceedings of the Board in reference to the administration of the laws for the Relief of the Poor; and the second, the administration of the laws affecting Local Government and the Public Health. Under the latter, the Board refer to the

LOANS OF SANITARY AUTHORITIES.

Under this head, the Board report that the loans sanctioned by the General Board of Health during the ten years which followed the passing of the Public Health Act, 1848, amounted to £2,956,178; that those sanctioned by the Secretary of State during the next thirteen years reached a total of £7,363,366, and that those sanctioned by the Local Government Board during the five years which elapsed from Dec. 31, 1871, to Dec. 31, 1876, have been no less than £7,770,348. The sums sanctioned during the last three years together, make up more than a third of the total amounts which have been sanctioned during the last twenty-nine years.

During the year ending Dec., 1876, the loans to Urban Sanitary Authorities, sanctioned by the Local Government Board, amounted to £2,565,708; and the loans sanctioned to Rural Sanitary Authorities, during the same period, amounted to £193,615. In addition to these loans, the Board gave their sanction to the borrowing of £16,500 by the West Kent Main Sewerage Board, under the provisions of their Act of 1875, and loans amounting to £10,500 were sanctioned under the Baths and Washouses Act.

In an appendix to the report is given a list of the districts in which loans have been sanctioned during the year, from which we extract the following:—

Loans Sanctioned to Urban Sanitary Authorities.

District.	Purpose of Loan.	No. of Years.	Amount.
Aberavon	Gas supply	—	£2,500
Accrington	Purchase & erectn. of public lamps	30	2,000
Alton	Water supply	30	6,240
Ashby-de-la-Zouch	Do.	30	740
Atherton	Do.	20	2,158
Baildon	Do.	30	665
Bath	Do.	60	10,000
Do.	Do.	30	8,250
Bedford	Do.	20	1,500
Beverley	Gas supply	30	3,000
Birkdale	Do., &c., &c.	50	3,574
Blackpool	Do.	50	15,000
Blaydon-on-Tyne	Water supply	30	900
Bridgend	Street improvemts. & public lightg.	20	205
Burley	Water supply	—	2,000
Buxton	Sewerage and water supply	50	7,575
Castleton	Lighting	20	300
Chipping Norton	Water supply	30	400
Coleford	Do.	30	560
Cowpen	Do.	30	8,500
Croydon	Do.	30	7,400
Do.	Do.	30	2,450
Do.	Do.	30	1,050
Do.	Do.	30	3,250
Darton	Do.	30	4,500
Dover	Do.	30	700
Dronfield	Do.	30	1,939
Ebbw Vale	Do.	50	23,900
Epsom	Sewerage and do.	30	1,000
Fareham	Gas pillars, lamps, meters, and paving	20	240
Do.	Water supply, &c.	30	180
Gloucester	Sewerage and water supply	30	26,700
Hastings	Water supply	30	7,000
Hindley	Gas supply	—	12,500
Honiton	Sewerage and water supply	30	4,200
Horncastle	For purposes of Horncastle Gas Act, 1875	—	2,473
Do.	Do.	—	14,418
Kirkburton	Water supply	30	3,000
Do.	Lighting	7	120
Kirkby Lonsdale	Water supply	30	5,000
Leamington	Water supply & sewer ventilation	30	18,000
Leigh	Water supply	30	5,000
Littlehampton	Do.	30	1,500
Long Eaton	Lamp-posts, lamps, & gas-meters	10	300
Llanelly	Water supply	50	19,487
Loughborough	Do.	30	1,300
Lower Brixham	Water supply, sewerage, &c.	20	300
Malvern	Gas supply	20	1,500
Merthyr Tydfil	Water supply	50	2,000
Do.	Do.	51	17,100
Millom	Water and gas supply	—	20,000
Nantwich	Sewerage, water supply, &c.	20	420
Do.	Water supply	30	750
Neath	For purposes of Gas Act, 1874	50	4,907
Neston and Parkgate	Sewerage and water supply	30	600
Newmills	Street improvements and lighting	30	750
Newport, Isle of Wight	Purchase of water-works	30	12,000
Newton in Mackerfield	Water supply	30	3,000
Do.	Gas supply	—	5,000
Ossett-cum-Gawthorpe	Water supply	—	17,800
Over Darwen	Gas supply	—	15,000
Penzance	Water supply	30	1,700
Peterborough	Do.	50	60,000

LOANS SANCTIONED TO URBAN SANITARY AUTHORITIES (*continued*).

District.	Purpose of Loan.	No. of Years.	Amount.
Pontefract	Water supply and sewerage	30	4,630
Ripley	Sewerage and water supply	50	17,515
Rugby	Water supply	30	600
Sale	Offices, &c., and public lamps	30	3,050
Shipley	Water supply	—	5,000
Do.	Do.	50	24,122
Sittingbourne	Do.	30	440
Skelmersdale	Gas supply	20	8,000
Stafford	Water supply	—	5,000
Stanhope	Sewerage, and water supply	30	220
Stroud	Water supply	50	800
Do.	Do., and street improvement	30	205
Do.	Do., and weighing machine	30	280
Teignmouth	Sewerage, gas, and water	30	6,000
Truro	Water supply	10	914
Tunbridge Wells	Do.	40	12,180
Upperthong	Water supply	30	1,500
Warwick	Do.	50	4,150
Do.	Do.	50	13,350
Wellingborough	Do.	30	5,000
Wigan	Gas supply	—	10,000
Winsford	Water supply	30	7,500
Do.	Lamps, lamp-posts, &c.	20	400
Do.	Water supply	30	6,500
Wombwell	Do.	30	6,000

LOANS SANCTIONED TO RURAL SANITARY AUTHORITIES.

Appleby	Water supply	50	£2,310
Ardsley	Do.	20	446
Beadlam	Do.	30	500
Bettws-y-Coed	Do., and sewerage	30	760
Bongate	Do.	30	1,400
Brampton	Do., and sewerage	30	7,500
Cadoxton	Do.	21	240
Do.	Do.	21	100
Chapeltown	Do.	30	5,000
Coal Aston	Do.	30	257
Dronfield	Do.	30	403
East Dean	Do.	30	7,436
East Dereham	Do.	30	700
Ellenborough	Do.	30	400
Flaxley	Do.	30	1,003
Fryerning	Do., and sewerage	30	840
Hampton, Great & Little	Do. do.	30	900
Hinders Lane and Dockham	Water supply	30	311
Hovingham	Do., and sewerage	30	1,000
Ingatestone	Do. do.	30	1,502
Llanrwst	Do. do.	30	1,564
Luccombe	Do.	30	170
Nawton	Do.	30	1,000
Newton-on-the-Moor	Do.	30	530
Do.	Do.	30	232
Ovington	Do.	30	300
Pentyrch	Do.	30	500
Porlock	Do.	30	350
Do.	Do.	30	300
Ramsden	Do.	30	256
Resolven	Do.	30	700
St. Andrew's (Cardiff)	Do.	30	200
Sawdon (Yorks)	Do.	30	340
Taddington and Priestcliff	Do.	30	1,200
Unstone	Do.	30	1,334
Whiston	Water supply	30	500
Willersey	Do.	25	500
Ystradgunlais	Do.	30	400

The remaining sums which the Rural Authorities were empowered to raise were principally for sewerage purposes.

It appears from another appendix to the report that, during the year under consideration, the Public Works Loan Commissioners agreed to advance to Local Boards, Corporations, &c., under section 243 of the Public Health Act, 1875, and on the recommendation of the Local Government Board, the sum of £1,126,756. The actual amount advanced in the twelve months was £706,519, the rate of interest being three and a half and four per cent.

Comparing the sanctions granted in the year now under report with those given in previous years, it will be found that the increase has been £727,911 in urban, and £56,307 in rural districts, as compared with the preceding year; that year having, it will be observed, itself shown an increase as compared with its predecessor of £497,616 in urban, and £17,993 in rural districts. It may also be pointed out that the amounts sanctioned in the year in respect of urban districts have been more than four times as great as those sanctioned in 1872 in respect of both classes of districts; while those sanctioned in rural districts have exceeded by nearly one-half those sanctioned in 1875, and are more than nine times as great as those sanctioned in 1873. It should also be noted, as an evidence of the increased activity which has been employed as regards sanitary improvements in rural parishes, since the constitution of the guardians as rural sanitary authorities in the place of the vestries, that the amounts sanctioned in respect of rural districts during the year have exceeded by £38,756 the total aggregate amounts which were sanctioned during the four years from 1867 to 1871 under the Sewage Utilization Acts.

The Board state, that a point of much importance, to which, in these cases, they have directed attention, has been the repayment of existing loans by the borrowing authorities; and that their efforts, in several instances, have led to the liquidation of arrears, and, in others, to increased regularity in setting aside and investing the sinking-funds.

In addition to the loans sanctioned by the Board, there have been loans raised under the authority of distinct Acts of Parliament; and the report states that—

The list of loans sanctioned by us includes the whole of the amounts which have been authorized to be borrowed under the Public Health Act, 1875, during the past year; but it must not be taken as by any means showing the full extent to which the sanitary authorities of the country have been empowered to contract loans during the year. In order to ascertain this, it is necessary that the list should be supplemented with the loans which they were authorized to raise for similar purposes, by means of special legislation during the last session of Parliament, without the necessity of any further sanction on our part. The following tabular statement will show the names of the districts in respect of which these loans were sanctioned by the Legislature; their amounts; the purposes to which they are to be applied; and the names of the Acts of Parliament by which the special powers were in each case conferred:—

Name of District.	Amount Sanctioned.	Purpose of Loan.	Local Act.
	£		
Blackrod	20,000	Water-works	Blackrod Local Board Act, 1876.
Dewsbury	135,000	Do.	Dewsbury & Heckmondwike Water-Works Act, 1876.
Heckmondwike	45,000	Do.	
Halifax	300,000	Do.	Halifax Water and Gas Extension Act, 1876.
Do.	75,000	Gas-works	
Do.	10,000	Markets & slaughterhouses	
Huddersfield	400,000	Water-works	Huddersfield Water-Works and Improvement Act, 1876.
Do.	400,000	General purposes	
Lancaster	75,000	Do. do.	Lancaster Water and Improvement Act, 1876.
Leicester	15,000	Municipal buildgs.	Leicester Improvement Act, 1876.
Do.	135,000	General purposes	
Leigh	75,000	Water-works	Leigh and Hindley Local Boards Water Act, 1876.
Hindley	50,000	Do.	
Llandudno	50,000	General purposes	Llandudno Improvement Act, 1876.
Do.	Unascertained.	Purchase of water and gas works	
Newport (Mon.)	43,000	Street improvements	Newport (Monmouthsh.) Improvement Act, 1876.
Do. do.	4,000	Cemetery	
Do. do.	5,000	Town-hall	
Do. do.	5,000	Free library	
Oldbury	Unascertained.	Purchase of gas-works	Oldbury Local Board of Health Act, 1876.
Do.	40,000	Gas extensions	
Padiham	Unascertained.	Purchase of gas-works	Padiham Local Board Act, 1876.
Do.	10,000	Gas extension	
Smethwick	Unascertained.	Purchase of gas-works	Smethwick Local Board Gas Act, 1876.
Do.	50,000	Gas extensions	
Stockton, Middlesbrough	Unascertained.	Purchase of water-works	Stockton and Middlesbrough Corporations Water-Works Act, 1876.
Do.	700,000	Water-works extension	
Stocktn-on-Tees	17,600	Markets	Stockton-on-Tees Market Act, 1876.
Southport	230,000	Gas-works	Southport Improvement Act, 1876.
Do.	53,000	Markets, &c.	
Do.	42,000	Tramways	
Do.	25,000	Promenades	
Do.	19,000	Street improvements	
Tipton	Unascertained.	Purchase of gas-works	Tipton Local Board (Gas) Act, 1876.
Do.	25,000	Gas extensions	
Walsall	Unascertained.	Purchase of gas-works	Walsall Gas Purchase and Extension Act, 1876.
Do.	100,000	General purposes	
West Bromwich	Unascertained.	Purchase of gas-works	WestBromwich Improvement Gas Act, 1876.
Do. do.	50,000	Gas extension	
Whitehaven	3,000	Market-house, lighting, &c.	Whitehaven Harbour and Town Improvement Act, 1876.
Do.	2,000	Water-works	
Do.	2,000	Sewerage-works	
Total	3,211,100		

It will be seen from the above table that the borrowing powers thus conferred amounted to £3,211,100, without taking into consideration the unascertained sums, which will be required for the purchase of no less than eight water and gas undertakings. One of these, that of the Stockton, Middlesbrough, and Yarm Water-Works Company is a very considerable undertaking, and is to be purchased under compulsory powers; the corporation being required by their Act, as the consideration for the purchase, either to issue to the shareholders perpetual annuities amounting to £18,647, or, at the option of the company, to pay a sum in gross (£466,175) calculated at 25 years purchase of the annuities; besides in either case taking over the whole of the statutory debt of the company, and paying an additional sum to be determined by arbitration on account of the compulsory sale and the prospective value of the undertaking.

If the loans authorized to be raised by sanitary authorities under the local Acts passed during the year are added to the amounts included in the sanctions granted by us to sanitary authorities during the same period, and allowance is made for the unascertained purchase-moneys of the water-works and gas-works proposed to be purchased, the total will be little, if anything, under £7,000,000.

The report states that on the 25th of March, 1876, the period up to which the latest returns had been received, the total amounts of the outstanding loans of Urban and Rural Sanitary Authorities were as follows, viz.:—

Urban Sanitary Authorities	£38,546,284
Rural Sanitary Authorities	204,456
Total	£38,750,740

The Board state that the loans raised by Urban Sanitary Authorities, during the last two years, amount together to very nearly one-fourth part of the whole of the outstanding loans of such Authorities, and the loans raised during the latter of the two years are £1,019,227 in excess of those raised during the former.

RIVERS POLLUTION PREVENTION ACT, 1876.

By the Rivers Pollution Prevention Act, 1876 (39 & 40 Vict., c. 75), which received the Royal Assent on the 15th of August, 1876, new and important powers have been given to us, to urban and rural sanitary authorities, and to the general public, with a view to the prevention of the pollution of streams.

The Act has for the first time rendered the pollution of streams a statutory offence, in respect of which the County Court may make a summary order requiring the offender to discontinue the pollution.

Subject to certain restrictions contained in the Act, all sanitary authorities are empowered to enforce its provisions in relation to any stream which is within or passes through any part of their district; and any expenses incurred by them in the execution of the Act will be payable as if they were expenses incurred in the execution of the Public Health Act, 1875.

Proceedings may also be instituted, in respect of offences against the Act, by individuals aggrieved by the commission of the offence, except in cases where the offence consists of the pollution of the stream by the liquid refuse from a manufactory, or the solid or liquid refuse from a mine. It is proper, however, to observe that if a local authority refuse to take action for the suppression of any mining or manufacturing pollution, the Board are empowered, on the complaint of any person interested, to require the local authority to commence proceedings.

The portion of the Act which relates to the pollution of streams, or the interference with their due flow by solid refuse, came into force at the passing of the Act. But as regards the more important and numerous pollutions caused by the discharge into streams of solid or liquid sewage matter, the liquid refuse from manufactories, and the refuse, both solid and liquid, from mines, no proceedings can be taken until the expiration of twelve months from the 15th of August, 1876, the date of the passing of the Act.

Inspectors of proper qualifications appointed by us are authorized to grant certificates to the effect that the means used for rendering harmless any sewage, or poisonous, noxious, or polluting solid or liquid sewage matter discharged into any stream, are the best or only practicable and available means under the circumstances of the particular case; and any such certificate will, in all Courts and proceedings under the Act, be conclusive evidence of the fact.

We have already appointed, as inspectors under the Act, Mr. Robert Rawlinson, C.E., C.B., our chief engineering inspector, and Dr. Angus Smith, F.R.S., our chief inspector under the Alkali Acts.

It is hoped that the enactments to which we have drawn attention will conduce in no inconsiderable degree to the mitigation of existing, and the prevention of future pollutions of streams; and that at the same time they will not be found to have imposed undue restrictions upon either the local authorities or the manufacturing or mining interests of the country.

PROVISIONAL ORDERS.

The number of Provisional Orders issued by the Board since their last report, and which were confirmed by Parliament during the session of 1876, was 100, being an increase of 24 over the previous year, and of 50 over the year 1874. The only Order issued by the Board, in 1876, under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, was an Order authorizing the Skelmersdale (Lancashire) Local Board to construct gas-works, and manufacture gas upon certain lands specified in the Order, and to supply gas for public and private purposes within the limits of their district.

PRIVATE BILLS.

The Board state that the number of private Bills upon which they reported to Parliament during the session of 1877 was 35. Among these were Bills for the acquisition, under compulsory powers or otherwise, of gas undertakings by the Corporations of Ashton-under-Lyne, Blackburn, Hanley, Longton, Newcastle-under-Lyme, and Warrington, and the Local Boards of Burslem, Colne, Denton, Dukinfield, and Ramsgate; the purchase of water-works undertakings by the Corporation of Wakefield, and the Local Boards of Heywood and Ramsgate.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT.

The Board state that—

By the 4th section of the Municipal Corporations (Borough Funds) Act, 1872 (35 & 36 Vict., cap. 91), our approval in respect of matters within our jurisdiction is required to be obtained by every Urban Sanitary Authority promoting or opposing any local or personal Bill or Bills in Parliament, before any expenses in relation to such promotion or opposition can be charged upon the rates. We have received numerous applications from Urban Sanitary Authorities for our approval, under the above section, to resolutions passed by them to promote or oppose Bills relating to matters within our jurisdiction, during the last session, with a view to advance or protect the interests of the inhabitants of their districts. In 28 cases we approved of the promotion of, and in 66 of the opposition to these Bills. We have in every case, before giving our approval, been furnished with a copy of the Bill to which the resolution has related, together with a statement of the grounds of the proposed promotion or opposition, and a statutory declaration showing that the requirements of the Act had been complied with, both as regards the resolution passed by the local authority, and as regards the consent given by the owners and ratepayers to the charging of the expenses upon the rates.

SALE OF FOOD AND DRUGS, AND THE ALKALI ACTS.

In speaking of the operations of the former of these Acts, the Board remark, as an incidental advantage, that (although water was not brought within the scope of the Act) it appears that many analyses of water have been made by the public analysts, and in some cases the Authorities have made special arrangements with them for the purpose. With respect to the latter Act they observe:

That the Alkali Acts of 1863 and 1874 have worked beneficially appears from the report of the chief inspector, Dr. Angus Smith, for the years 1875 and 1876. Dr. Angus Smith states that the inquiry to vegetation caused by the evolution of noxious gases from chemical works has greatly diminished since the Act came into operation, and that this result is as much owing to voluntary action on the part of manufacturers as to the exercise of the compulsory powers given by the Act. Dr. Angus Smith anticipates a still greater improvement from the growth of chemical knowledge and the increasing market for muriatic and sulphuric acid, which makes the condensation of these gases a remunerative process. As an instance of the benefit resulting from the Act, it may be mentioned that the last report from the Tyne district showed that the average escape of muriatic acid from the chimneys of the works in that locality was 0·07 grain per cubic foot, whereas before the passing of the Act an escape of 0·2 grain per cubic foot was considered too low a rate to be capable of being maintained.

METROPOLIS WATER SUPPLY.

The report states, on the authority of Major Bolton, C.E., that during the year 1876 eighteen miles of new water-mains were laid down in the Metropolis. "The number of houses receiving constant supply from the several Water Companies is also steadily increasing, though much remains to be done in this respect, and one Company (the Southwark and Vauxhall) have hitherto failed to provide a constant supply in their district. Additional impounding and subsiding reservoirs are urgently required at the works of some of the Companies, as, until such reservoirs exist, these Companies will be unable to supply properly-filtered water during the prevalence of floods in the Thames, and, even under less trying conditions, the work of filtration is not always satisfactorily performed." The Board give, in an appendix to their report, the result of Dr. Frankland's analyses, showing the comparative rates of purity of the water supplied by the several Companies. "The number of street hydrants for the extinction of fires has, during the last twelve months, increased from 2622 to 4227. It further appears that the Directors of the Metropolitan Water Companies generally have expressed their willingness to pay for house accommodation for turncocks at the several fire-engine stations, if such accommodation is provided by the Metropolitan Board of Works. Should this be done, it is anticipated that the occasions on which any deficiency of water is met with at fires in the Metropolis will be reduced to a minimum."

The Annual Report of Major Bolton, the Water Examiner, and of Mr. Stoneham, the Auditor of the Accounts of the Metropolitan Water Companies, are among the appendices to the Report of the Board, and they will be given *in extenso* in the next number of the JOURNAL.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

PROVISIONAL ORDERS.

SIR,—As the time has come round again when those who contemplate making application, in the ensuing session of Parliament, for Provisional Orders should be preparing their notices, I shall feel obliged if you will permit me to say another word or two in your JOURNAL upon this matter.

A few years back, one of the directors of a small gas company, not under statutory regulations, having quarrelled with his co-directors, resigned his seat at the board, and commenced proceedings against the company, whereby he prevented them opening the ground. It was represented to the Government of the day that there were many other gas companies in different parts of the kingdom liable to similar proceedings, and that they were deterred from making application to Parliament for special Acts on account of the expense, which, upon their small capitals, would be very heavy. And, therefore, an Act was brought in and passed, under the title of "The Gas and Water-Works Facilities Act, 1870," to empower the Board of Trade to grant to gas and water companies certain powers, hitherto only conferred by special Acts, by means of Provisional Orders, and, consequently, at a greatly reduced price.

The operation of this Act, however, has not been altogether so satisfactory as was expected, inasmuch as out of about 900 companies at that time carrying on their operations without statutory powers, there have only been between 70 and 80, in the seven years since the Act was passed, who have availed themselves of its provisions.

Companies supplying a district with gas without parliamentary powers are, to use a phrase that has become common in parliamentary committee-rooms, carrying on an illegal business, and, consequently, are liable, at the instance of any one who likes to put the law in force, to be stopped in their proceedings; but, if that were done, the public would be deprived of their gas supply, and so the companies are allowed to continue their operations unmolested.

On the other hand, the law which would prevent a gas company from opening the ground would also prevent any one else from doing the same thing. The companies are, therefore, in effect, secured a monopoly of their respective districts, as absolutely as they would be if express statutory provision had been made for the purpose.

Monopolies of every kind are repugnant to the governing principles of this country, and equally so to the feelings of the inhabitants. No monopoly should be allowed without being placed under restrictions as a security to the public against the privilege being abused.

To compel the public to purchase anything they may require from one person only, and to allow that person to supply the article of any quality he pleases, and charge any price he likes, is directly opposed to all our notions of "free trade" and "fair play," and ought not to be allowed.

Some of these non-statutory companies do, no doubt, conduct their operations as creditably and as much to the benefit of the public as any of the other companies, but others again act in a very different spirit, and cause great dissatisfaction in their respective districts, and then, as a remedy for this, the authorities impose further restrictions upon the statutory companies, leaving the others as they are, to do as they please, and cause still greater dissatisfaction.

It cannot be expected that this state of things will be allowed to continue for ever. On the contrary, it may be looked upon as a certainty that if the non-statutory companies will not avail themselves of the facilities expressly provided for their benefit, and place themselves under regulations, some general measure will be passed, and probably within a session or two, to answer the same purpose, as respects the public, but without regard to the interests of the companies. Non-statutory companies having no vested interests like the others, it is impossible, of course, to say at the present time in what way this would be done; but, as a matter of conjecture only, it would probably be either—

By giving powers to the local authorities to apply by themselves—adversely to the companies, but at the companies expense—for Provisional Orders to regulate the companies proceedings in their respective districts; or,

By allowing the local authorities, when their districts are supplied by companies without statutory powers, to contract for a supply with companies having such powers in some adjoining district, and giving general powers to those companies to extend their districts for that purpose.

W. Livesey.

Gas and Water Companies Association, 6, Victoria Street, Westminster Abbey, Oct. 29, 1877.

AMMONIA TESTS.

Sir,—I have a grievance. By granting me a little space in your columns you will afford me an opportunity of giving vent to my pent-up indignation.

In your issue a fortnight ago, one of your correspondents, very justly commenting upon the value of some colour tests, recently introduced to the gas world, to better enable gas managers to detect the presence, in their gas, of one or two very troublesome neighbours of mine, considers a similar means of detection necessary for me. Now, Sir, I appeal to you, what have I done to be treated in this manner? Why am I to be put on a par with the above referred to troublesome and worthless neighbours of mine? I know they are dreadful customers to deal with, and require a detective at their heels continually; but surely, Sir, I am not very difficult to manage, and, as you know, if I only have a little scrubbing or washing I am perfectly quiet and harmless. My friend Turmeric is ready at all times to indicate my whereabouts, and it requires very little persuasion to make me move on quietly, without troubling anybody.

Following up the idea of your first correspondent, another, in last week's issue, has undertaken generously to instruct his friends as to an "accurate" means of detecting me. And where? In the gas! Can you understand my feelings after reading his letter? Why does he expect to find me in the gas? It is far from my wish to be there, and I fear, for the sake of being able to try this suggested test, some of his gas-making friends will force my footsteps where I have no desire to tread. The only consolation I have is, that the majority of gas makers in this country treat me more considerately. Why should I be dragged to meet an early death, and that death—horrible to think of!—death by burning? But, Sir, I cannot submit to this treatment without a struggle; and the trouble I cause when they get me there has been too apparent to some people lately.

Now, Sir, please urge your friends and subscribers not to adopt any such tests, but rather to give me a trial with the cold water cure above mentioned, and not to forget that a small piece of turmeric paper will enable any one to detect which road I am taking, my desire being, of course, after figuring conspicuously on the "right side" of your balance-sheets, to die a natural death, and eventually to be laid under the ground, where the value of my presence is well known.

NH_3.

THE PRICE OF GAS AT DUMBARTON.

Sir,—Your article on the Corporation of Dumbarton has caused the convenor of the Gas Committee to request me to correct some erroneous statements, and to ask you to publish the source from whence you derived the substance of the remarks.

You begin by stating that "the Corporation of Dumbarton are making the most of a reduction in the price of gas from 5s. to 4s. 7d., and boast," &c. Now, sir, the corporation have only done what is reported in your "Trade Notes from Scotland," on Oct. 16. If you consider "unvarnished truth" making "the most" of anything, then, indeed, the corporation have made "the most" of the reduction.

You next convey the same idea the corporation did at their meeting about reducing the price to "the price charged before the great advance in coal;" and then you inform your readers that "the company paid a 20 per cent. dividend," when in reality they only could, and only did, pay 1s. 9d. per share for the last fifteen months of their existence (the selling price of their shares was £16 10s.); further, they were only able to declare this paltry dividend from the proceeds of their tools, &c., bought by the corporation. This information is from a most reliable source—directors and shareholders of the company. A reason can be given for the company selling gas at an unremunerative price.

You now tell us that "as soon as the corporation took over the works they raised the price to 6s. per 1000 feet," when the truth is they lost hundreds of pounds selling gas at 4s. 7d. per 1000.

You also say "the charge has been gradually reduced, until it has now arrived at the price charged by the company in 1874," when the fact is, the company were numbered with the past on Aug. 1, 1873; since this date the corporation have supplied all the coal gas consumed in the royal burgh.

You finish this remarkable article by throwing "cold water" on the corporation's working of the concern by mentioning that the profits are "little over £1000." Your own report (already referred to) gives the profits as £1726. This sum is considered here, in the north, of much greater value than a "little over £1000." Apart from this, I consider it is next to impossible to form a correct estimate of either a company's or a corporation's working without knowing the varied circumstances that surround each works. I would not say that "the works do not appear to be very profitable to the corporation" (having small works), although at the end of four years working they had not even a clear £1000 of profit (after paying all lawful charges), for I hold it is not desirable for corporations to make great profits from the gas. They should rather reduce the price, and make the works profitable in this channel, for by so doing the duty imposed upon them by Parliament is honourably fulfilled, and the first and best interests of consumers consulted. This, I am proud to say, is the policy of the corporation I represent.

Hitherto I have observed you desire to correct misstatements that have crept into your columns, therefore I ask you to oblige by inserting this in your next issue.

Jas. M'Gilchrist.

Dumbarton Corporation Gas Department, Gas-Works, Dumbarton, Oct. 25, 1877.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

Sir,—Your issue of yesterday contains the first portion of the report of this Association's tenth half-yearly meeting. Reference is made therein to "Copp's Patent Anti-Dip," which reference, if not explained further, is calculated to do Mr. Copp an injury, as, from the report, it would appear that I had, without any show of reason, failed to implement an offer made at the preceding meeting, which was to supply each of any three members of the Association, that the committee might name, with a set of this apparatus on approval.

This proposal was seemingly well received by the meeting, and several members accepted the offer, but they did so in an informal way—*i.e.*, direct to me, instead of through the committee of the Association, under whose auspices the tests were to be made.

It seems, however, from your report, that a formal minute was made of the proposal in the minutes of the meeting, and that, some months afterwards, the secretary made inquiry of the parties regarding the apparatus, and the reply from each was that, as I had not, as arranged, erected the apparatus, they were unable to report upon its utility. I was unable to be present at this meeting, or I would have explained, as through your favour I now do, that, from the time I made the offer, I received no information from the secretary as to who were to receive the anti-dips, nor from the parties themselves as to the form of hydraulic in use, with size and position of bridge and dip-pipes, information they were well aware, from the circulars handed to the members present, was required by me before I could supply the apparatus. In fact, so indifferent did the Association seem by reason of this silence, that I thought no more of the affair.

However, since the question has been thus publicly raised, I am quite willing to hold the offer in force, and will be glad to supply them on receiving the particulars of fitting-parts alluded to from the three gentlemen whose names I have received from the secretary of the West of Scotland Association of Gas Managers this morning.

Glasgow, Oct. 24, 1877. D. M. Nelson.

PORTLAND CEMENT CONCRETE.

Sir,—"H. T's" letter on this subject raises an important question. When I read my paper in 1874, I proposed to give only the results of my experience. At the same time, at the very outset of the work, I recognized, as one of the conditions of the problem I set myself to accomplish, the well-known fact that Portland Cement Concrete is thoroughly pervious to water, and, therefore, I was not disappointed when I found it leaked like a colander. "H. T." says: "Some engineers say it is water-tight." I can only reply, I should like to meet one of them. I have seen about as much concrete work as most men, having greatly interested myself in the dockyard extension here, and I never saw or heard of any concrete that was water-tight. I was talking to-day to Mr. E. P. Smith, of the dockyard extension works, on this subject—a gentleman who, perhaps, has dealt with concrete in a practical way more than any man in England—and he informs me that, though he has used 70,000 tons of cement in concrete work, he never knew a single yard of concrete but let water pass readily through it. Therefore, I say I am justified in coming to the conclusion that if "H. T." wants a water-tight concrete tank, he must render it with *neat* cement, and carefully trowel it as it is setting.

J. Douglas.

Portsea, Oct. 27, 1877.

SALES OF GAS ACTS.

Sir,—The Sales of Gas Acts were intended to, and had the effect of, stopping the use of meters which had a large margin of error against the consumers. But gas companies were very properly successful in retaining a portion of this margin (2 per cent.), in consideration of their allowing one of 3 per cent. against themselves, making together 5 per cent. (the least necessary) for the range of float and valve.

But since the passing of the Acts, the invention of a wet meter, requiring no range whatever, makes it no longer necessary for sellers and buyers of gas to share a loss between them which now need not exist; and it will be strange indeed, should the altered state of things be ignored, or any attempt made to pass an amendment Act, without the previous Royal Commission suggested by the Journal of Gas Lighting.

Oct. 27, 1877. William Cowan.

GAS PURIFICATION, Etc.

Sir,—The constant use of the term "sulphide of calcium," as a name for the material employed for the extraction of bisulphide of carbon from coal gas, has led to some confusion of mind, and, consequently, erroneous formulæ; for one naturally concludes that by sulphide of calcium, the mono-sulphide (CaS) is thereby meant. I much doubt whether this compound exists in purifiers; it is certainly inert as far as bisulphide of carbon is concerned.

The reaction that takes place when slaked lime is submitted to the action of sulphuretted hydrogen is expressed in the following equation:—

$$CaO, H_2O + 2\,H_2S = CaS, H_2S + 2\,H_2O,$$

being a simple interchange of oxygen with sulphur. Now, this sulp-

hydrate of sulphide of calcium is competent to form another sulphur salt by direct combination with bisulphide of carbon, having the following formula:—CaS, H_2SCS_2. This is a bright yellow salt, in which CaS is the base, and H_2SCS_2 the acid which can be separated from its base by the action of strong acids, and is the hydro-sulpho-bisulpho-carbonic acid. In the commencement of 1876 I discovered that this compound existed in tolerably large quantities in some samples of gas lime, and that it might be made use of, for the production of bisulphide of carbon, for it is but a feeble combination. At a moderate temperature all the bisulphide is released, and can easily be condensed into the liquid form. The CaS, H_2S is then left in its original green state. This could be re-used for the removal of bisulphide of carbon, or still further heated to expel the combined sulphuretted hydrogen, leaving CaS as a whitish yellow powder. Now, at this point, if steam be passed through it, a reaction (attended with evolution of heat) takes places—

$$2\,CaS + 2\,H_2O = CaO, H_2O + CaS, H_2S.$$

It is thus that steam expels the sulphur from the monosulphide of calcium. This process was described in March, 1876.

When carbonic acid attacks sulphydrated sulphide of calcium there is a considerable development of heat, which is sufficient to decompose the CaS, H_2SCS_2, as before described. This decomposition does not, I believe, take place because the carbonic acid is a stronger acid, for in repeating Zeise's experiment, I found that the H_2SCS_2 would decompose alkaline carbonates, as he pointed out some 50 years ago. When foul lime, especially that used for the removal of CS_2, is exposed to the atmosphere, sulphuretted hydrogen, bisulphide of carbon, and perhaps hydrosulphate of ammonia, are evolved, and we can then well say with Hamlet: "This most excellent canopy, the air, look you, this majestic roof fretted with golden fire, why, it appears no other thing to me than a foul and pestilent congregation of vapours."

This suggests how little we know of the limits of solubilities of vapours in gases. We know exactly how much salt will dissolve in water at a given temperature. We know that chloride of silver is insoluble in water, but that it is freely soluble in water containing ammonia; but where is the man who knows how much naphthaline can be dissolved in various gaseous mixtures at various temperatures? There is here a field for scientific investigation that must eventually be of value to gas makers. This reminds me of the increased illuminating power due to desiccation of coal gas. This is, according to Dr. Heumann's theory, partly due to removal of a neutral vapour that requires to be heated to temperature of flame without return, and partly due to the concentration of bulk. Speaking of neutral diluents in illuminating gases, I would like to add an item of my own, which may possibly interest the learned doctor, if he reads your able JOURNAL, as doubtless he does. It is this: That the increment of diminution in illuminating power due to the cooling or absorbtion of heat by neutral gases varies, as I have proved by experiment, with their specific heats; consequently, compound neutral gases like carbonic acid are slightly more pernicious in this respect than simple gases like nitrogen. The difference, however, is slight.

Permit me to point out an evident error in Mr. Davenport's letter concerning an ammonia colour test. For one-tenth pure sulphuric acid, read decinormal pure sulphuric acid, &c. I fail to see the advantage of this method over the present one. It would compel the attendance of some unfortunate person to watch when the litmus changed colour, which would be a pretty considerable time when the gas contained, say, half a grain per 100 cubic feet.

If a test for small quantities of ammonia be really wanted, pass half a foot or so of gas very gently through cold pure water, and Nesslerize the feebly ammoniacal solution obtained. But this extremely delicate test is, I find, difficult of employment in gas-works, owing to the quantity of ammonia about, and is, besides, only to be relied on in very skilful hands. Under the circumstances, with regard to this mode, perhaps *le jeu n'en vaut pas la chandelle.*

I have often intended to call the attention of your readers to the fact that the table of specific gravities, as it is called, ordinarily used for correcting the volume of gas, is in itself incorrect. When this table was first calculated by my father, the late Alexander Wright, the increment of dilation for each additional degree of Fahrenheit was commonly accepted as the 1-480th part. Since then the careful experiments of M. Regnault and others have fixed the fraction at 1-491·13th part. As I have no time for the calculation of a new table, I append the formula, based on the scale of absolute temperature.

$$\frac{V\,P}{T} \times 17{\cdot}304.$$

Where V = volume.
P = pressure.
T = temperature on absolute scale.

17·304 = the ratio of $\frac{T^\circ}{P^\circ}$, where T° is standard temperature on absolute scale, and P° standard pressure.

LEWIS THOMPSON WRIGHT.

23, *Sutherland Gardens, W., Oct.* 26, 1877.

NAPHTHALINE.

SIR,—I thank you for having been good enough to give in the JOURNAL OF GAS LIGHTING a translation of my paper, presented to the *Société Technique de l'Industrie du Gaz en France*, upon the researches and experiments I have made upon naphthaline. This paper, as your readers may have seen, describes in all sincerity my opinions upon this question, my experiments and their results. Certain points are contradictory. The theory is open to discussion; but, notwithstanding that, I thought I ought to reproduce my paper just as I read it at the meeting of the Society at Rouen, as I considered I had no longer the right to make any alterations in it after that reading.

In the number for Oct. 16 you do me the honour to criticize very judiciously the theoretical part of my process. This criticism of the chemical reactions in the pipes can only be refuted by facts and experiments, and in this I shall probably not succeed. However that may be, allow me to complete your account of my process, by calling your attention to the fact that in my paper I have proved by the last experiments that naphthaline is not reproduced after the gas, which has been first of all dried, has again taken up water in a saturating vessel through which it has passed. This is a fact that contradicts my first experiments, which were made in the laboratory, in performing which I heated the gas to 70° C., and then cooled it down again to zero. If, in this case, I reproduced naphthaline with gas which, having been first dried, again took up aqueous vapour, it was doubtless owing to the difference in the heating and cooling temperatures of the gas.

But when, in the last experiments, I operated upon gas under ordinary working conditions, and at the natural temperatures to which it is subject, I did not reproduce naphthaline. This leads me to the conclusion that it will probably not be necessary to put any fixed oil into the meter, or upon the water in the gasholder-tank. Besides, you are aware that all the gas that passes into a meter does not come in contact with the water. One portion is in contact with the damp periphery of the compartments of the drum, and the other with the surface of the water; but the central mass of the gas, not being in contact with the water, cannot become saturated with aqueous vapour. In an ordinary flask the sphere of gas that bubbles in the liquid is only affected by that liquid upon its periphery, and not in the centre; so that if we desire to be sure about the reactions for which we are searching, we are forced to liberate the gas in little bubbles, and in several flasks successively. *A fortiori* will this apply with regard to what takes place on a large scale in a station-meter and in a gasholder, where the gas does not generally remain very long at rest, except in summer time—the only season, when, thanks to the temperature of the atmosphere, the water in the tank should give off a quantity of vapour, though probably insufficient to saturate the entire volume of gas contained in the holder. If, then, oil is not indispensably necessary, the application of my process is thereby rendered more simple.

There remains one interesting point which it is well to make known. If the gas is not made to pass twice through the lime, as represented in the engraving reproduced in your JOURNAL of the 25th of September, the naphthaline that has precipitated at the same time as the water has been arrested may be carried onward by the current of gas, and deposited farther on. It is necessary, by a second passage—which, besides, ensures desiccation—to arrest, as by filtration, the naphthaline carried forward. The same result might be attained by passing the gas into an empty receptacle—such as a purifier, for instance—where the solid naphthaline would deposit by decantation of the gas, which would there sustain a great diminution in velocity. In its passage through the lime the gas becomes heated; but there is nothing to be feared from this. It becomes heated in the ordinary purifiers, by the reactions which there take place; and do we not heat it at the present day, when exhaustion is effected by means of the steam-jet apparatus? I give all these details because it is necessary that those who are about to try this process should be informed of them.

I will conclude by requesting you to convey my thanks to Dr. Phelps and Mr. Thomas Newbigging for the letters which those gentlemen have addressed to you, and in which they congratulate me upon my researches. It is the first and most flattering recompense for my labour.

L. BRÉMOND,
Member of the British Association of Gas Managers.

Versailles, Oct. 23, 1877.

Legal Intelligence.

WORSHIP STREET POLICE COURT.—THURSDAY, OCT. 25.

(*Before Mr.* HANNAY.)

METROPOLITAN BOARD OF WORKS *v.* COMMERCIAL GAS COMPANY.

In this case the Metropolitan Board of Works sought to enforce penalties upon the company of £50 a day for eight days during the month of September, in which, according to the reports of their gas examiner, the company supplied gas of less purity than it was required to be under the provisions of their Act. When the case was before the Court on previous occasions (as reported in last week's JOURNAL), the magistrate who then presided (Mr. Bushby) refused to grant distress warrants, as asked for by the Board, until the company had an opportunity of showing whether they had any answer to the complaints, and he therefore issued eight summonses against them for the purpose of raising the question, and adjourned the hearing until this day.

Mr. BESLEY now appeared for the Metropolitan Board, and Mr. REED for the Commercial Gas Company.

Mr. BESLEY said: I appear here to-day, sir, for the Metropolitan Board, to ask you to issue your warrant of distress against the Commercial Gas Company, in respect of eight penalties of £50 each—and no less—as I think I can convince you that you have no power to inflict a penalty of less amount. I think I shall satisfy you that your duty in this matter is purely ministerial, and that you have no judicial power to inquire into the matter beyond what you have in the analogous case of a poor-rate, in which you are called upon to distrain for the amount. In the present instance, the Metropolitan Board of Works have considered it their duty, in various ways, to endeavour to assist the public, in taking care that the legislative enactments controlling the gas companies supplying the Metropolis shall be enforced, and that consumers should have the benefit of the recent Acts of Parliament passed with the view of regulating these companies. The particular Act of Parliament to which I have to call your attention is the Commercial Gas Act, 1875—38 & 39 Vict., cap. cc. Private Act 200. By that Act the duties of the company now before you are pointed out, and I think it would be convenient if I were, first of all, to call your attention to the 47th section of the Act, which provides for the infliction of penalties for excess of impurity in the gas supplied by them. The clause is as follows:—"If on any day the gas supplied by the Commercial Company from any station is of less purity than it ought to be under this Act, the company shall forfeit a sum of £50 for each station in respect of which they are so in default." Then, sir, the 50th section provides that—"The report of the Chief Gas Examiner, on appeal, or the report of a gas examiner, after the time for appeal has elapsed and no appeal has been brought, showing a case of defective power, excessive impurity, or insufficient pressure, shall be conclusive evidence of the liability of the Commercial Company to a forfeiture in respect thereof, and every forfeiture under this Act shall be leviable by distress, and on proof of any such report before two justices, or a magistrate, at any time within one month after the date of the report, such justices or magistrate shall issue their or his warrant of distress accordingly." These sections, sir, show really what your duty is, and I shall be able to satisfy you that there has been a liability to forfeiture in respect to eight days—viz., the 15th, 17th, 18th, 19th, 20th, 21st, 22nd and 24th of September. On those eight days I shall

show that the gas supplied by the company contained an excess of impurity, for which they are liable to a penalty of £400, and I shall ask for a warrant of distress upon them to levy for that amount. The question—the only question, I presume, upon which I shall have to give evidence will be, first of all, that on these eight days the gas was not of such purity as it ought to have been, and next, that there has been no appeal from the report of the gas examiner.

The MAGISTRATE: I was going to ask what that meant—"The report of the Chief Gas Examiner, on appeal, or the report of a gas examiner, after the time for appeal has elapsed."

Mr. BESLEY: The 42nd section provides that, "If the Commercial Company think themselves aggrieved by any report of a gas examiner, they may, within seven days after the day on which that report is delivered to the company, appeal to the Chief Gas Examiner, whose decision (after hearing the parties) shall be final and conclusive, and the Chief Gas Examiner shall report every such decision to the Metropolitan Board." Then, sir, I may refer you to the machinery by which it is known that the gas was not of sufficient purity, by calling your attention to the 29th section. By this section the purity of the gas is prescribed. It says: "The Gas Referees shall from time to time ascertain with what degree of purity the Commercial Company can reasonably be required to make and supply gas continuously, without occasioning a nuisance to the neighbourhood in which the works are situate, and shall thereupon prescribe and certify the maximum amount of impurity in each form, with which gas supplied by the company should be allowed to be charged, and the time from which the allowance thereof should be enforced as against the company; regard being had to the necessity for any alteration of works by the company consequent on any such certificate." The Gas Referees, I may say, are an independent authority appointed for the purpose of making regulations in respect of all the gas companies in the Metropolis, and you will see that they are to ascertain the degree of purity with which the gas can be supplied. By the 32nd section they are to prescribe proper testing-places and apparatus, and by the 35th section it is provided that—"The Metropolitan Board shall, as soon as may be after the commencement of this Act, appoint, and shall always keep appointed, a competent and impartial person or persons to be a gas examiner or gas examiners for the several testing-places." By the 36th section it is provided that—"There shall be a Chief Gas Examiner, being a competent and impartial person, from time to time appointed by and removable by the Board of Trade." Then there is a provision in the next section—the 37th—for testing the purity of the gas supplied. "A gas examiner shall, at each testing-place, make daily such number of tests as the Gas Referees may prescribe for ascertaining whether, during the whole of each day, the illuminating power, purity, and pressure of the gas supplied by the Commercial Company are such as are respectively prescribed under this Act." I need not trouble you with regard to the question of the average testings. I have called your attention to the 42nd section. The gas examiners are the servants of the Metropolitan Board of Works, but the Chief Gas Examiner is a higher authority, being appointed by the Board of Trade. Under the 42nd section, if the company feel themselves aggrieved with the gas examiner for reporting too much impurity, there are seven days within which they may appeal to the Chief Gas Examiner, whose decision is to be final and conclusive. We see here, then, the scope of the Act of Parliament, and we have only to look to what the Gas Referees have done. They have made a notification for the summer half year, 1877, a copy of which I hold in my hand, prescribing testing places for the Commercial Company, which are two in number. I need not trouble you about the first, but with regard to the second, I may say that it is situated in Parnell Road, Old Ford. As to the question of the illuminating power of the gas, we are not at all concerned about that, but with reference to the impurity, there are several things which are treated as impurities. There is sulphuretted hydrogen, ammonia, and sulphur compounds other than sulphuretted hydrogen. With regard to sulphuretted hydrogen, I believe we have no complaint to make about that; the impurity with which we are concerned at present is ammonia, and respecting this, the Gas Referees have prescribed, under the powers of the Act of Parliament, that the maximum amount of this impurity shall be 2½ grains per 100 cubic feet of gas. That 2½ grains is not to be exceeded. For the comfort of people, burning gas in their houses, who suffer from the presence of ammonia in the discoloration of articles in their rooms, and from the disagreeable sensation produced in the throat, when burning gas in which there is an excess of ammonia, it is provided that the gas supplied by the companies shall not contain more than 2½ grains per 100 cubic feet. I shall prove the excess in this case, and, if necessary try to justify the action of the Metropolitan Board—but I suppose it is not necessary. They are really in the position of being trustees of the public interest, and they are the public authority for preventing the Act of Parliament from being disobeyed. They are not proceeding rashly, for the Commercial Gas Company are old offenders, and there is no doubt they are very much given to excess in this way. I shall prove by Mr. Keates that on the 15th of September there were 4¼ grains——

The MAGISTRATE: I thought you were proceeding under the 50th section—"The report of a gas examiner, after the time for appeal has elapsed and no appeal"——

Mr. BESLEY: I shall show that there was an excess on these days, that there was such a report, and that there was no appeal. Whether true or not is not a question to be entertained in this Court; for you observe that the report of a gas examiner, if no appeal is made against it to the Chief Gas Examiner, is conclusive and final.

The MAGISTRATE: Which is the section that imposes upon a gas examiner the duty of reporting.

Mr. BESLEY: The 37th. And then there is the 41st, which provides that—"Each gas examiner shall on each day make and deliver a report of the result of the testings of the gas supplied by the Commercial Gas Company, conducted by him on the immediately preceding day, to the Metropolitan Board, to the Chief Gas Examiner, and to the Commercial Company." I will now proceed to prove my case, and I think you will have no question to entertain here. Perhaps I might mention to you that analogous proceedings were taken in the early part of 1870 in the City of London, under an Act of Parliament precisely similar.

Mr. REED: I do not know whether my learned friend was there; but "analogous cases" are dangerous things.

Mr. BESLEY: I was. I do not wish to argue that case.

The MAGISTRATE: For my information, how is this penalty to be levied?

Mr. BESLEY: By distress warrant. The forfeiture has been incurred under the statute, and you have nothing to do but to issue a distress warrant.

The MAGISTRATE: Let us see. "If on any day the gas supplied by the Commercial Company from any station is of less purity than it ought to be under this Act, the company shall forfeit a sum of £50 for each station in respect of which they are so in default." But how forfeit, or when? By the mere fact?

Mr. BESLEY: By the mere fact of allowing the time for appeal to pass by. If you will look back to the 42nd section, you will see that, if the company think themselves aggrieved, they may, within seven days, appeal to the Chief Gas Examiner, whose decision, after hearing the parties, is final and conclusive. They have not done so. Then the 47th section says they are to forfeit a sum of £50 for each day on which there is an excess of impurity; and the 50th section goes on to say that this forfeiture shall be leviable by distress, "and on proof of any such report before two justices, or a magistrate, at any time within one month after the date of the report, such justices or magistrate shall issue their or his warrant of distress accordingly."

The MAGISTRATE: If there is no other machinery, that is the one to take.

Mr. BESLEY: There is no other. I was going to state that, in the case to which I referred, the Chartered Company were convicted by the Lord Mayor for an excess of impurity; and, though an appeal was lodged, it was only upon the point that the prosecution being by the City Solicitor, the jurisdiction of the Lord Mayor was ousted, because he could not be a judge in a case in which the Corporation were the acting authority for the prosecution. The other question was not for a moment disputed. Justice Hawkins was in that case.

Mr. REED: I think there was not an exact similarity in that case. The sections of this Act are of a peculiar kind.

Mr. BESLEY: That was a case under the City of London Gas Act, 1868.

The MAGISTRATE: There seems to be nothing in this Act relating to the case beyond the sections you have quoted; but it certainly is curious to find in an Act of Parliament that forfeiture accrues *ipso facto* without proceedings, on the commission of the acts. There are, I know, similar instances, but I cannot at the moment recall them.

Mr. BESLEY: The case to which I have referred is reported in the JOURNAL OF GAS LIGHTING, Jan. 18, 1870. I may say that the Acts of the South Metropolitan and Chartered Companies contain similar provisions to those in the Commercial Act.

Mr. *J. Nicholson*, examined by Mr. BESLEY.

I am a clerk in the office of the Metropolitan Board of Works. I produce a copy of the Board minutes of Feb. 16, 1877. That is the minute containing the appointment of Mr. Edwin Addenbrooke as gas examiner at the two testing-places of the Commercial Gas Company—viz., No. 6, Wellclose Square, and No. 12, Parnell Road.

Mr. BESLEY: Has there been any appeal to the Chief Gas Examiner in reference to the report of the gas examiner?

Mr. REED: Is this gentleman the Chief Gas Examiner?

Mr. BESLEY: The 42nd section provides that if the company think themselves aggrieved by the report of a gas examiner they may appeal to the Chief Gas Examiner, whose decision shall be final and conclusive. (To witness:) Now, has the Chief Gas Examiner reported any decision?

The MAGISTRATE: The witness is only a clerk. The objection is taken; how is he to know?

Mr. BESLEY: Is it your duty to register all notices received by the Metropolitan Board?

Witness: To register all correspondence.

In reference to gas matters?—General correspondence.

Including gas matters?—Yes.

In the discharge of your duty have you had any report from the Chief Gas Examiner on any appeal from the Commercial Gas Company?—No report has been received.

Mr. REED: I have nothing to ask.

Mr. *Edwin Addenbrooke*, examined by Mr. BESLEY.

As gas examiner did you, at the Parnell Road testing-place, test the gas of the defendant company on the eight days in question?—I did.

Do you produce your certificates referring to the days in question?—Yes [handed in].

These are the daily reports of the results of your testings?—These are my reports on the eight days.

Upon each of these occasions did you report the presence of ammonia in a larger quantity than 2½ grains?

Mr. REED: What he reported appears here; therefore my friend need not ask.

Mr. BESLEY: 2·9 grains is how much in excess?—It is ·4 in excess; 2·5 is the maximum.

Anything beyond that is excess?—Yes.

The MAGISTRATE: When are these dated.

Mr. BESLEY: They are each dated the day mentioned. (To witness:) Do you supply copies of your reports to the gas company?—I supply two—one by courtesy to the engineer, and one to the secretary.

On each day?—On each day.

Have you been called upon to attend before the Chief Gas Examiner in reference to these reports?—No.

The MAGISTRATE: Do you report to the Chief Gas Examiner?—Yes.

Mr. BESLEY: And you send a copy of your report to the secretary, and, by courtesy, to the engineer of the company?—Yes.

Cross-examined by Mr. REED: Are these the reports you made?—They are copies; there are six copies.

These are not the original documents?—Yes; they are the original documents.

I ask whether these are the original documents presented to the Chief Gas Examiner?—There are six copies made by me. I send one to each party—one to the Chief Examiner, one to the clerk and one to the chemist of the Board, and two to the company.

Were these documents which you supplied to any one?—These are the copies which I sent to the Board.

The MAGISTRATE: The effect of his answer is that they are all originals.

Mr. REED: Now, as a matter of fact, these, each of them, represent each day what you ascertained on that day?—That is so.

Are these the only reports you made, or are they counterparts of the original ones?—There were five others sent out besides.

Mr. BESLEY: They are all signed by you?—All signed by me, and are reports of mine.

Mr. REED: May I ask one question? You said you made your tests at the Parnell Road station. You mean the testing-place?—Yes.

There is, according to the Act, a testing-place for each station?—For each works.

It is described in the Act as "each station." You know the section. Where is the station for which Parnell Road is the testing-place?—It is Johnson's Fields—off the Mile End Road.

Were those testings of yours taken, extending over 24 hours?—Over 24 hours, according to the "Instructions."

Let me ask you. I believe you are the gas examiner under clause 37. Did you give any notice "forthwith," on finding that the purity of the gas was defective?—I did. The notice I sent to the engineer was underlined. That was sufficient notice, I think, that ammonia was in excess.

You gave that on the following day—the day after the date on which your examination was made?—It was posted the same day. I cannot say what time next day it would reach them.

Mr. *Charles Fry*, examined by Mr. BESLEY.

You are the principal assistant in the solicitor's department of the Metropolitan Board of Works?—Yes.

Did you attend at the chief office of the Commercial Gas Company yesterday?—Yes.

You served a notice to produce the "Notification of the Gas Referees for the Summer Half Year, 1877"?—Yes.

Who did you see there?—The secretary. [Copy of notification produced.] What is the maximum amount of ammonia?

The MAGISTRATE: That is what I want to see. Where is the section of the Act in which it states that the Gas Referees shall fix the amount of impurity?

Mr. BESLEY: Section 29. "The Gas Referees shall, from time to time, . . . prescribe and certify the maximum amount of impurity in each form with which gas supplied by the company should be allowed to be charged," &c. That is our case, sir.

Mr. REED: I should like to call my witnesses, and make my observations afterwards.

The MAGISTRATE: I think that cannot be done—I mean, it is an irregularity.

Mr. REED: I do not wish to be guilty of any irregularity. I will, therefore, just say a word or two upon the case. And in the first place, with regard to what my learned friend, Mr. Besley, has stated, I think that if the Metropolitan Board had been aware of the facts of this case, probably the matter would not have been brought before you at all. I think it is only right to point this out—this is the first time that any action of this nature has been taken, so I understand; certainly it is the first time the Metropolitan Bord ever took such action, and I do not think the Board were aware that the 37th section of the Act, for example, had not been complied with, except in the manner represented by the witness Addenbrooke when he was before you. You will see, sir, that section 37 requires that, "in the event of the gas being ascertained to be defective in any particular, he (the gas examiner) shall *forthwith* give notice thereof to the company." All that the examiner in this case did was to underline the alleged defect in the report which, by courtesy, he supplied to the engineer. I will show presently how this is material, but just now will content myself by pointing out the fact. The Board of Works, however, at once proceed to enforce penalties of £50 a day for eight days, without giving any notice beforehand to my clients. In the first instance, they asked for distress warrants without giving us the opportunity of being heard in defence, notwithstanding that the 49th section of the Act provides that "no forfeiture shall be incurred in any case with respect to which it is certified by the Chief Examiner that the defect of illuminating power, excess of impurity, or insufficiency of pressure was occasioned by an unavoidable cause or accident."

The MAGISTRATE: You had it in your power to prove that by appealing.

Mr. REED: I think I shall be able to satisfy you in a few moments that it is not so. This is one of those obscure Acts which are difficult to interpret; but I think I shall be able to satisfy you on the point. But the first objection I have to take to these proceedings is that this is not a case within the jurisdiction of this Court. And the ground upon which I take it is the 47th section, which prescribes that, "If on any day the gas supplied by the Commercial Company from any station is of less purity than it ought to be under this Act, the company shall forfeit a sum of £50 for each station in respect of which they are so in default." The offence, therefore, is the supply from a station. Immediately the gas is supplied "from any station," then straightway the offence is committed at the station. The penalty and punishment, such as it is, is dependent upon the locality of the station, and it is in respect of the station that the forfeiture is inflicted. And let me point out that this is not a technical objection; there are great merits behind in my case, and if I am allowed to discuss the matter I can show that the excess of ammonia with which the company stand charged has arisen from causes which are beyond the power of my clients to find out. You will observe, sir, from the reports that have been put in, that, so far from this being a systematical offence, it appears that, both before and subsequent to the eight days complained of, the amount of this impurity in the gas was very much below the required maximum; in fact, I see that on some days it is a mere decimal fraction.

The MAGISTRATE: 2·6.

Mr. REED: That is within the eight days.

The MAGISTRATE: You say that for some days previously it was much below?

Mr. REED: And subsequently. The state of things is this——

The MAGISTRATE: I wish to listen to you with all possible indulgence as regards time, still I do not understand how you can grapple with the fact that there has been no appeal.

Mr. REED: In the first place, I should like to deal with the question of jurisdiction.

The MAGISTRATE: Do you mean that this station is out of my district?

Mr. REED: Yes; it is proved to be in Mile End. That being so, the only question——

Mr. BESLEY: This point has been decided, sir, by your learned colleague.

Mr. REED: I understand—I was not here—that great doubt was expressed by your colleague at the time.

The MAGISTRATE: It is rather unfortunate, to some extent, that he is not here to-day. The clause (50) says: "On proof of any such report before two justices or a magistrate." It does not seem to confine it to any particular jurisdiction.

Mr. REED: This Act incorporates the Act of 1860, in the interpretation clause of which "a magistrate" is defined to be one dealing with a matter within his jurisdiction. "The word magistrate means any police or stipendiary magistrate acting in and for the district of the Metropolis in which the matter referred to him arises." I submit that whenever it is said, "You are to appear before a justice or a magistrate," it means necessarily a justice or a magistrate acting within the district in which the offence or ground of complaint arises, and that there is nothing in this section to enlarge the jurisdiction of the Court. Having reference, therefore, to the section already quoted, the only question now is whether supplying gas from the station is the offence, and if so whether the station is within your jurisdiction. And this is not a mere technical objection, because, supposing the company to be in any particular district, and there were two stations in any particular place, there would be a liability in respect to each, for the emission of gas of an improper kind; but if not, then only for the station which was in default. Passing from this, the next point I will deal with is this—supposing you are against me on the question of jurisdiction——

The MAGISTRATE: Just let me see the section of the Act of 1860 which you quoted.

Mr. REED: It is the interpretation clause.

The MAGISTRATE: I presume there are various matters in that Act—various offences—for which a magistrate can convict; for instance, stealing gas.

Mr. REED: I do not know whether there are in this Act, but no doubt there are offences. A man may be summoned for stealing gas, or he might be indicted.

Mr. BESLEY: There is a matter referred to the magistrate in the 16th section—"Differences as to security to be determined by a magistrate."

Mr. REED: You will see, sir, by these summonses you are asked to issue distress warrants.

The MAGISTRATE: Where is the clause incorporating this Act.?

Mr. REED: The company's Act incorporates the Act of 1860. Section 3 of the Act of 1860 says: "This Act applies to the several gas companies, and to all parties already or hereafter supplying gas within the Metropolis." The Commercial Company's Act says: "The following parts of the Metropolis Gas Act, 1860, shall not apply to the Commercial Company." Of course, by reason, they would all otherwise apply; but it says so many sections shall not apply—section 2, &c.

The MAGISTRATE: Were you here on the last occasion, Mr. Besley?

Mr. BESLEY: No, sir.

The MAGISTRATE: There may be something in this matter. I think the power given to a metropolitan magistrate to act as two justices only applies to particular districts, although we have general jurisdiction.

Mr. BESLEY: I think you will not be pressed by that difficulty if you will look at the words of the 47th section of the company's Act. They are not "the gas supplied *at* any station," but "from any station."

The MAGISTRATE: I do not know where the gas is tested.

Mr. BESLEY: Where the gas is tested is in the Parnell Road, and that is in your jurisdiction.

The MAGISTRATE: Where the gas is tested is not in my jurisdiction?

Mr. BESLEY: Yes, it is.

The MAGISTRATE: Then I misunderstood your point—the station of the company is not.

Mr. REED: In the 32nd section you will see the difference between "station" and "testing-place." "The Gas Referees shall, from time to time, prescribe and certify the situation and number of the testing-places," &c.

The MAGISTRATE: We had better have the witness back again.

Mr. *Addenbrooke* recalled, and examined by the MAGISTRATE.

Where you test it, is that gas supplied in the district?—It is supplied from the works situated in Johnson's Felds, close against the Mile End Road.

And where is it supplied? Where was it being supplied when you tested it?—Round the neighbourhood of the testing-station.

Where is that?—No 12, Parnell Road, Old Ford.

The MAGISTRATE: Then that is in this district. That seems to get over the difficulty.

Mr. REED: I am afraid I have not made myself clear. The testing-place is undoubtedly within the district; but the station for which it is the testing place is not within the jurisdiction of the Court. And I say, if you look at the 47th section, the offence is supplying gas from the station. The question is. where was the offence committed?

The MAGISTRATE: I think that is rather too strict.

Mr. REED: It ought to be strict in an offence of this nature. I put my question thus: Is it where the gas is tested, or at the station? But, putting this aside, I go on to section 50, which is this: "The report of the Chief Gas Examiner on appeal, or the report of a gas examiner after the time for appeal has elapsed and no appeal has been brought, showing a case of defective power, excessive impurity, or insufficient pressure, shall be conclusive evidence of the liability of the Commercial Company to a forfeiture in respect thereof." That is the first part of the section. Now, in order that this report may be a report which is conclusive, it is necessary that it should be a report showing a case of excessive impurity within the meaning of the Act. And I want to point out that this is not what is shown by the documents put before you. The 47th section prescribes the offence, but the 39th section says: "The average of all the testings of purity prescribed under this Act on three successive days shall be deemed to represent the purity on each of such days." Therefore, in order to show that on any particular day there has been an excess of impurity, it is necessary to take the impurity of three days, and show that, on the average, the impurity of each day was in excess. The object is obvious, although there might be to-day 1 per cent. excess, to-morrow it might be less, and the next day still less; and, taking the three days together, it is perfectly consistent that on not one of the days was the legal offence, contemplated by the section, committed.

The MAGISTRATE: It might as regards the amount.

Mr. REED: As regards the amount it would; but the second way I put it is this, that the report of the examiner must be a report which *shows* the excessive impurity in the gas tested. It is not enough for him to state that on such and such dates there were particular deficiencies, leaving you to add them up and strike the average yourself. It must be a report showing that, on an average, there was a deficiency of purity on the day in question. Now, it is with a view to this that the 37th section is put in. If it is ascertained that the gas is defective in any particular, the examiner is to "forthwith give notice thereof to the company." It is not to be given, as under the 41st section, by supplying on the following day "a report of the results of the testings of the gas" on the preceding day; notice is to be given to the company "forthwith." The reports referred to in the 41st section are reports only of the testings of the previous day, and not of the average testings of three successive days. What my learned friend, on this occasion, has to show is, that the report of one day's testing is evidence upon which we are to be convicted of an offence under the 50th section. I contend that, in order to be an offence, it must be shown that the deficiency is upon the average of three days testings. You will see, upon an examination of the Act, that the report in question is a different report from that contemplated in section 41, which is a report of the testings of one day only, whereas the report contemplated by section 50 is a report showing a case of excessive impurity, which cannot be done except on the average of three days according to section 39. If this is so, then I submit that these reports are not conclusive at all in any way.

The MAGISTRATE: Let me just look at the clause. These reports are only made for one day?

Mr. REED: Yes; the witness said each report showed the result of the testing on one particular day. I only make this additional observation, that, seeing the report is made evidence, the Act must be strictly complied with. Then it is necessary, if that is so, that the report should be a report of the gas examiner after the time for appeal has lapsed and no appeal has been brought.

Mr. BESLEY: The 41st section prohibits that.

The MAGISTRATE: The report is to be supplied to the Metropolitan Board, the Chief Gas Examiner, and the company, on the next day.

Mr. REED: I say these are different reports. One report is a report for each day; the other is to show that the Act has been broken on three days. By section 42 the company are at liberty to appeal to the Chief Gas Examiner within seven days after the report is delivered to them. Now, there was no report delivered to us except the report which is before you now, and if I am correct in saying that that report is not the report which is contemplated in the 50th section, then I am entitled to your judgment.

The MAGISTRATE: I do not wish to misunderstand you, but I imagine that this is the only report. The 37th section requires the gas examiner to give notice to the company on his ascertaining that the gas is defective in purity, and that is done by his report, which is given under section 41. He gives no other notice under section 37.

Mr. REED: I contend that if any steps were to be taken, they ought to have given us a notice of the fact, which, for example, would be done by showing that, on the average of three days together, there had been an excess of impurity, instead of on one day only, which does not constitute an offence at all. If so, that report would have been a report upon which we should have been entitled to appeal. But it has never been delivered, and, therefore, there could be no appeal. But, after all, this is but another

way of putting the argument I put before. Then my friend seemed to think that you, sir, have no power to mitigate the penalty, but I submit that is an open question.

The MAGISTRATE: If it were a penalty I was imposing, I have full power to do so, but the Act of Parliament itself creates the forfeiture.

Mr. REED: The Act of Parliament speaks of a penalty.

The MAGISTRATE: No, a forfeiture.

Mr. REED: I think the words of the Act are sufficient for the purpose.

The MAGISTRATE: It does not say that upon proof of the report the magistrate shall thereupon convict, and shall then issue his warrant of distress. The language is peculiar; there are other instances of a similar nature, which, if I looked through Bailey "On Convictions," I could find, but I cannot at the moment remember them. I know there are cases in which there is no conviction, but a commitment.

Mr. REED: Whatever the jurisdiction of the magistrate, the argument I have put would be the same. On the question of mitigation, that would depend upon the 2 & 3 Vict., cap. 71, sec. 31.

The MAGISTRATE: That will not apply.

Mr. REED: Well, sir, it is for you to decide, but I cannot help thinking that the proceedings themselves—the very summonses upon which we are here—suppose that there is some power of mitigation.

The MAGISTRATE: I am not called upon to convict.

Mr. REED: Under the circumstances, I do not know what conclusion you may have come to in the matter, but I ask, in the event of your decision being against us on the question of jurisdiction, to which we attach considerable importance, and also on the question of the 50th section, that you will give us the opportunity of having the matter decided on solemn argument by means of a case, if applicable, or, if not, by the ordinary way of appeal.

Mr. BESLEY: I trust, sir, you will not grant a case.

The MAGISTRATE: I do not think I can under the 20th and 21st Vict. I suppose there is no appeal given by any of the Gas Acts. However, that would be a matter for after consideration. My colleague rather seemed to question whether he had power to do anything except to grant a warrant, but he thought it fairer to give your side the opportunity of being heard. However, that point I will consider if there is anything in it.

Mr. REED: With regard to the *quantum*, if you are against me, I think, after what I have said, there cannot be forfeiture for more than six days. From what has been said before you, you are asked to draw inferences, and, if you were to take the three days averages, there would be only six days upon which there was an excess of impurity. Upon the other points I further urge that under any circumstances my clients are not liable to more than one penalty. The supply was from one station only, and I shall be able to show that, according to the best opinions that can be obtained, the accident which caused the presence of the impurity during the eight days arose upon one day only, and that it was an accident which cannot be accounted for. The impure gas having escaped remained in the pipes for a considerable time before it was worked out. I submit that it would, therefore, be very hard to inflict a penalty for the whole eight days.

The MAGISTRATE: Surely your course was to appeal if you had such good grounds of excuse. You might have had the benefit of the 49th section, which says "No forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of illuminating power, excess of impurity, or insufficiency of pressure was occasioned by an unavoidable cause or accident."

Mr. REED: My contention is that the appeal in this case would be an appeal against a report showing that the forfeiture had occurred.

The MAGISTRATE: I suppose these forms of reports are the forms in universal use?

Mr. REED: I do not dispute that they are correct under section 41.

Mr. BESLEY: The Referees, in Appendix D to their "Instructions," have prescribed the form.

Mr. REED: It may be it is a perfectly correct form under section 41. I may state here that the practice has since been to send special notice, and I submit that should have been done before.

Mr. BESLEY: Sir, if your mind is at all in doubt, I should like to say something about the question of jurisdiction. I submit that where you have an Act of Parliament prescribing that there shall be a testing-place for impurity, and that testing-place is in your jurisdiction——

The MAGISTRATE: We have got over that. The only question I have on my mind is the question of figures—the question of the averages.

Mr. BESLEY: With regard to that, I may remark that by the 37th section the officer of the Metropolitan Board is bound to make daily testings of purity.

The MAGISTRATE: What do you make of the 39th clause?

Mr. BESLEY: I make it that when the company get a report, showing by a mark underneath that on one day the ammonia is in excess, they can, during the next two days, by an excess of purity, make up for it, so that on the average of the three days there would not be more than 2·5 grains per 100 feet. They would then have a good ground of appeal.

The MAGISTRATE: That would do now. Take the case of the 15th of September, it is 4·8 grains; then the two previous days it is 1·6 and 1·3.

Mr. BESLEY: It says for three successive days.

The MAGISTRATE: If you take one previous day and one subsequent to the 15th, then you have the quantity above the standard; so that really the question is where you are to start.

Mr. REED: They have not taken the 16th at all.

The MAGISTRATE (to Mr. Besley): I think you have satisfied me. The question of there being no appeal is conclusive. I have no jurisdiction to exercise beyond determining that the report is proved. The distress warrants will issue for the amounts claimed. I will consider afterwards whether I have power to grant a case. The time shall not run against the company, but it shall be considered that they have made the application.

Mr. BESLEY: I have to ask for costs in this case. We are not interested in the matter except as representing the public.

The MAGISTRATE: Have I any power to grant them?

Mr. BESLEY: Oh, yes; it is not a penalty.

The MAGISTRATE: I think not. I have great doubts whether there should have been any hearing at all, and whether our jurisdiction is not merely ministerial on proof of the report.

Mr. BESLEY: Our contention was really that you have done an act of grace in allowing a hearing.

The MAGISTRATE: I do not know whether it is so. It is rather an unusual thing under an Act of Parliament.

Mr. BESLEY: I do not think there is any power for you to grant costs.

LAMBETH POLICE COURT.—THURSDAY, OCT. 25.

(*Before Mr.* ELLISON.)

DISPUTED CORRECTNESS OF A GAS-METER.

The adjourned case of *The South Metropolitan Gas Company v. the Rev. R. O. T. Thorpe* was concluded on Thursday last.

Mr. HOWARD again represented the company, while the defendant appeared in person.

Mr. *Wm. Smith*, examined by Mr. HOWARD, said: I made the meter in question, and supplied it to the South Metropolitan Gas Company. It has since been returned to me for the purpose of repairs. We put an enclosed float in it, as we usually do in all meters coming to be repaired. We did not remove the ordinary float because it was defective, but simply substituted a new float, which is a modern improvement. If the float had been defective it would not have interfered with the registration. When the dial came to me it was in a perfect state, and we did not do anything to it, or to any part of the meter that could in any way affect the registration. I am perfectly prepared to swear that when the meter came into my possession it was a perfect instrument of measurement. If another dial had been put upon the meter, it would not have fitted, because all the spindles are fitted to the dial.

Cross-examined by Mr. THORPE: The index was removed from the meter, and I have no doubt that the same index was replaced. Of course, I do not stand by the man to see what he does, but it would be a thousand chances to one if the same index did not go on again. Even if it had been a different index it would not alter the registration, because all 5-light meters are made the same.

Mr. THORPE then addressed the magistrate, recapitulating the various points that he urged on the previous occasion.

Mr. ELLISON, in giving his decision, said: This case is a summons for non-payment of gas account, and it arose from a charge which was made upon the state of the meter taken on the 21st of March, when the dial registered 84,600 feet. On the 18th of December last, when it was previously taken, it stood at 56,200 feet, thus showing a consumption of gas during the quarter of 28,400 feet, and that, with the meter-rent, gives the sum of £4 10s. 11d. charged. This the defendant objected to as being in excess of the corresponding quarter in the previous year, and of all previous quarters. It seems that the defendant was recommended to take the meter to the Government office, and he declined to do so. There was some little disagreement as to that, and so something like a hostile attitude was taken up. I cannot help thinking that if the company, seeing that there was an excess over the usual consumption, and hearing from the defendant that he could not account for it in any way by any known excess of consumption in his own house, had offered to have the accuracy of the meter thoroughly tested, it would have been a more satisfactory method of dealing with a consumer. However, eventually, after some little correspondence, after the defendant had declined to take this upon himself, the company did do so, and the usual Government test was applied. The meter was found to be correct; but this test, though not an inaccurate one, and not usually an insufficient one, was not absolutely exact, for this reason: Mr. Detheridge stated that when the meter was tested for the tens it follows almost as a matter of course that the hundreds and thousands must be accurate. But, of course, in the case of this meter, Mr. Detheridge was unable to swear to anything more than his belief that the thousands and tens of thousands were correct, from the fact of his having tested the meter "up to the tens, and found it to be correct in that respect," and also from his unvarying experience, that when a meter was so correct it was correct in all other respects. The meter was subsequently tested to the tens of thousands, and found to be correct, and it has been used elsewhere in the meantime. The defendant was entitled to demand proof, not only of the identity of the meter, but also that it had not been in any way altered or tampered with between the first and second testings. In my opinion that evidence has now been given. The correctness of the meter is established. I think it would have been better, and I think it will be better for the future, when the correctness of a meter is challenged by a consumer, that the company should have it thoroughly tested up to the tens of thousands at once, and so take any further cause of complaint out of the consumer's mouth. The defendant denies that there has been any excess of consumption in his house; and all the causes that have been hinted at as accounting for an excess would not, I think, if they were accepted, really account for it to any material extent. The gas-stove was proved to have been in use as well before as during the period in dispute. The waste from imperfect burners in the dining-room may have had some little, but very little, to do with it. The waste is a decided waste, and I think it would be a very good thing for consumers if the company, who know precisely what burners are, would give themselves a little trouble sometimes to keep consumers right in this respect However, I do not think that that can in any way account for the waste in this case. Then there is a possibility of an escape of gas in the cellar close to the meter, and it is just possible that if the cellar is one which communicates with the air by gratings, that escape may go on for some time without detection. No evidence has been given as to that, and I did not think it necessary to bring the evidence out, because it seems to me that this gas has really been consumed as charged for, and with this explanation, that the greater amount paid for on this occasion arose from the omission to charge a part of the amount consumed during the previous quarter. That seems to me the correct explanation of the case. In the Christmas quarter the consumption charged was only 18s. 9d.—considerably less than either of the summer quarters preceding it, instead of greater, as is usually the case. In the previous year the Midsummer and Michaelmas quarters consumption was considerably less than the winter quarters. In 1874 it was less than half the winter, in 1875 it was about a fourth of the winter, and in the year in dispute it was more than one-half. Taking the two winter quarters as against the two summer quarters, there is really nothing to suggest an undue charge. I must, therefore, make the order for payment of the £4 10s. 11d.; but then there comes the question of the omission to charge the right amount for the Christmas quarter. Of course the responsibility for having made that omission rests with the company. It was negligence on their part, and it is a negligence which has brought the defendant into this false position, so that he was obliged either to pay a sum which he thought to be an unjust sum, or to take upon himself the burden of defending this summons at great trouble, and, as it might have been, very great expense. I, therefore, must decline to give the company their costs.

REDUCTIONS IN THE PRICE OF GAS.—The Bishop's Waltham Gas Company have reduced the price of gas from 7s. 6d. to 6s. 8d. per 1000 feet. At the meeting of the Manchester Corporation on Wednesday last, the following recommendation of the Gas Committee was agreed to:—"That from and after the 25th of December next the price of gas be reduced from 3s. 4d. to 3s. per 1000 feet within the city; from 3s. 10d. to 3s. 6d. per 1000 feet without the city; from 4s. 6d. to 4s. beyond the Mersey and district of New Moston, and that the price charged for gas supplied to the public lamps beyond the city be reduced 2s. 6d. per lamp per annum." The Gas Committee of the Corporation of Bolton have resolved that from the expiration of the quarterly account for December next the price of gas be reduced 2d. per 1000 cubic feet, and be charged as follows:—Price to consumers within the two miles radius of the town-hall, and to consumers of 250,000 cubic feet annually outside that radius, 3s. 10d. per 1000 cubic feet, with an allowance, on the payment within 21 days, of 6d. per 1000 cubic feet; to consumers outside the two miles radius other than above, and except in the under-mentioned districts, 4s. 4d. per 1000 cubic feet, with an allowance, on payment within 21 days, of 6d. per 1000 cubic feet; to consumers in Horwich, Longworth, and districts near to Bromley Cross, 4s. 6d. per 1000 cubic feet, with an allowance, on payment within 21 days, of 5d. per 1000 cubic feet.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

AVERAGE METER SYSTEM IN LAMBETH.—At the meeting of the Lambeth Vestry on the 25th inst., a report was brought up from the Lighting Committee giving the result of experience derived by burning gas in the public lamps on the average meter system. The total consumption of gas for the past twelve months, including 2½ per cent. for waste and leakage, amounted to 14,824,192 feet—the consumption of 733 lamps. The 2½ per cent. the committee consider an unfair charge, inasmuch as private consumers are not charged for waste and leakage. Moreover, the 72 metered lamps have all had new stand-pipes, and the whole 733 lamps have been furnished with new taps and regulators, and the fittings of the metered lamps are continually kept in order by the vestry inspector. The London Company, under the old system, always estimated that each public light consumed 22,000 feet per annum. Under the meter system, the actual consumption is 19,731, showing a difference of 2269 feet charged in excess by the company, which, at 3s. 6d. per 1000, gives a reduction of 8s. per lamp per annum—a saving (without the 2½ per cent.) of £293 4s. The cost of meters and governors was £670, and it is estimated the maintenance will will be £75 per annum. The current expenses are as follows:—Inspector's salary, £100; glycerine for meters, £5; sundries, £10; maintenance of meters, £75—total, £190. It was resolved that the vestry be recommended to authorize the committee to take under their control the lighting and repairing of the lamps of the London Company, whereby a further saving, it is anticipated, will be effected. It was also resolved that, considering the advantages gained by the meter system in the lighting district of the London Company, the vestry be recommended to empower this committee to enter into negotiations with the other companies. After some discussion, the committee's report was adopted. At the same meeting of the vestry, a letter was read from the Phœnix Company, intimating that from the expiration of the past quarter the charge for the supply of gas, &c., for the lamps lighted by the company in the parish was reduced to £4 5s. per lamp per annum in lieu of £4 7s. 6d.

AVERAGE METER SYSTEM IN ST. PANCRAS.

At the Meeting of the Lighting Committee of the Vestry, on Wednesday, Oct. 10—Mr. LIPHOLZ in the chair—the following report was presented and read, and ordered to be printed, and a copy thereof sent to each member of the vestry.

Vestry-Hall, Lighting Department, Oct. 10, 1877.

To the Lighting Committee.

Gentlemen,—Pursuant to your instructions, I have the honour to submit the following returns of the working of the average meter system, in connection with the lighting of the public street-lamps, for one year, ending the 30th of September last.

(Signed) T. ECCLESTON GIBB, Vestry-Clerk.

TABLE I.

Cost of New Works during the Year ending Sept. 30, 1877.

	£	s.	d.
Messrs. Berry and Son, removal of lamps and erection of new lamps	150	19	10
Messrs. Mowlem and others, reinstating roads, &c., disturbed for lamps	31	16	2
Messrs. Parkinson and Co., meters, regulators, cocks, and spindles	47	10	0
Mr. Batchelar, ladders and repairs	21	5	0
Mr. Lewingon, glycerine	8	17	6
Mr. Sugg and others, repairs to tools	9	5	10
Mr. Bailey and Abbott, tools	10	8	6
Mr. Skelton, catoptric reflectors	6	12	0
Mr. Heath, lighting torches	6	0	0
	£292	14	10

TABLE II.

Statement of the Cost of Repairs of Lamps, Lighting, Extinguishing, &c., for the Year ending Sept. 30, 1877.

	£	s.	d.
Messrs. Berry and Son, maintenance and repairs to lamp-columns, lanterns, &c.	316	5	5
Lamplighters wages	2424	9	0
	£2740	14	5

TABLE III.

Statement of the Cost of Maintenance of Meters and Governors, &c., and Salaries and Petty Expenses, for the Year ending Sept. 30, 1877.

	£	s.	d.
Messrs. Parkinson and Co., maintenance of meters, governors, &c., and annual testing of same	312	13	0
Clerk's salary	112	4	10
Lamplighters extra duty, assisting foremen taking indices	20	14	0
Committee's expenses on view	14	8	0
Petty expenses for the year	6	6	8
	£466	6	6

TABLE IV.

Details of the Hours of Burning Gas per Lamp, and Saving in respect of Twilight, for the Year ending Sept. 30, 1877.

Quarter ending	Number of Burning Hours Per Quarter. Hrs.	Min.	Average No. of Burning Hours per Night. Hrs.	Min.	Saving in respect of Twilight Per Quarter. Hrs.	Min.
December, 1876	1265	11	13	45	106	24
March, 1877	1160	21	12	53	95	—
June, 1877	636	4	6	59	155	58
September, 1877	707	32	7	41	177	23
The year	3769	8	41	18	534	45

TABLE V.

Showing the Comparative Cost of Gas and the Saving under the Old and New Systems.

Quarter ending		Number of Hours Charged for.		Consumption per Hour Charged for.		Consumption per Lamp per Quarter.		Number of Lamps.		Total Consumption per Quarter.		Rate per 1000 Feet.	£	s.	d.	Saving. £	s.	d.
Old system, Dec., 1876.	Sunset to sunrise.	1372	×	5·00	=	6860·00	×	3307½	=	22,689,450·00	×	3s. 9d.	4254	5	5			
New system, Dec., 1876.	Actual number of burning hours.	1265	×	4·41	=	5578·65	×	3307½	=	18,451,384·87	×	3s. 9d.	3459	12	7	794	12	10
Old system, Mar., 1877.	Sunset to sunrise.	1255	×	5·00	=	6275·00	×	3311½	=	20,779,662·50	×	3s. 6d.	3636	8	11			
New system, Mar., 1877.	Actual number of burning hours.	1160	×	4·34	=	5034·10	×	3311½	=	16,671,415·00	×	3s. 6d.	2917	9	10	718	19	1
Old system, June, 1877.	Sunset to sunrise.	792	×	5·00	=	3960·00	×	3323½	=	13,161,060·00	×	3s. 6d.	2303	3	8			
New system, June, 1877.	Actual number of burning hours.	636	×	4·44	=	2823·84	×	3323½	=	9,385,032·24	×	3s. 6d.	1642	7	6	660	16	2
Old system, Sept., 1877.	Sunset to sunrise.	885	×	5·00	=	4425·00	×	3373½	=	14,927,737·50	×	3s. 6d.	2612	6	10			
New system, Sept., 1877.	Actual number of burning hours.	707	×	4·53	=	3202·71	×	3373½	=	10,804,342·18	×	3s. 6d.	1890	15	0	721	11	10
																£2895	19	11

TABLE VI.

Showing the Comparative Cost of Lighting and Extinguishing, &c., and the Saving under the Old and New Systems.

Old System.

		£	s.	d.	£	s.	d.
Cost of lighting, extinguishing, and repairs to lamps, quarter ending Dec., 1876—	3307½ lamps at 18s. per annum	744	3	9			
Do., March, 1877—	3311½ " " "	745	1	9			
Do., June "	3323½ " " "	747	15	9			
Do., Sept. "	3373½ " " "	759	0	9			
					2996	2	0

New System.

	£	s.	d.
Cost of lighting, extinguishing, and repairs to lamps as per Table II.	2740	14	5
Total saving for the year	£255	7	7

TABLE VII.

Showing the Total Saving by the Meter System.

	£	s.	d.	£	s.	d.
In the cost of gas shown by Table V.				2895	19	11
In the cost of lighting and extinguishing, and in repairs and maintenance of lamps, as shown by Table VI.	255	7	7			
Deduct—				3151	7	6
Annual proportion of cost of meters, meter-boxes, governors, cocks, &c., £3226 13s. 9d.	320	0	0			
Cost of maintenance of meters, salaries of officers, &c., as shown in Table III.	466	6	6			
				786	6	6
				2365	1	0
Received on account of private lamps	157	10	0			
Received from gas company, allowance for two lamps	10	10	0			
				168	0	0
Total saving for the year				2533	1	0

GAS SUFFOCATION CASE AT PORT GLASGOW.—On Tuesday last this case was before Sheriff Smith and a jury in the Greenock Sheriff Court. Patrick M'Cardle, plumber, Port Glasgow, was charged with culpable homicide, or culpable neglect of duty, in so far as, on the morning of Wednesday, the 8th of August, a widow, named Elizabeth Lang, was found dead in the house of James Reid, the death being due, it was alleged, to the neglect of M'Cardle, who, when examining the gas-meter in the house, had failed to fasten the coupling properly, so that the gas had escaped, and caused the woman's death. After a number of witnesses had been examined, the Fiscal said that the inquiry which had taken place would serve the purpose of inducing greater caution on the part of all persons having to do with gas. He did not press for a conviction. The jury unanimously found the accused not guilty, and the sheriff, in dismissing M'Cardle, said he left the bar without a stain upon his character. It was almost needless to give him any caution, for it had been proved that he was a particularly cautious man, but it might be for the benefit of all that too great caution in matters of this kind could not be taken, when application to the proper quarter would find immediate remedy.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Continued from p. 647.*)

Mr. WILLIAM SUGG (London) read the following paper on

SUGG'S ILLUMINATING POWER METER.

In February, 1876, I read before the Institution of Civil Engineers, in London, a paper upon the Illuminating Power Meter. I had then necessarily to review, in as rapid a manner as possible, all that had been done in the way of gas-testing, in so far as it related to the standard burner. But as I have now the pleasure of addressing an audience entirely composed of gas engineers, who are thoroughly acquainted with all these practical details of gas-testing, I intend, in this short paper, to confine myself more to the instrument itself than to the general system of gas-testing. I must, however, commence with some remarks explanatory of the origin of this instrument. They are simply these. As far back as 1868, I was engaged, in collaboration with Mr. Kirkham, then engineer to the Imperial Gaslight and Coke Company, in a series of experiments, with a view to establish the relationship (as regards its indication of the illuminating power of gas) between the Lowe Jet Photometer and the systems adopted for the verification of illuminating power in England and France, so that we might construct a table for the use of engineers working with the Lowe Jet Photometer. We then tried both the Carcel lamp, burning colza oil, and the parliamentary sperm candles, manufactured by the best makers. In the performance of these experiments we discovered that the sperm candle was an extremely variable kind of standard, and as it was then, so it is now. Of this I shall offer you what I think is a convincing proof shortly. But as our work was to lay down a table of comparison between the illuminating power of gas, as estimated by the aid of sperm candles, and the jet photometer, we devised a photometer in the form of a cross, at which four operators could work simultaneously, comparing the same gas-flame with different candles; and so, by making a large number of experiments, we arrived at a tolerably accurate estimate of the illuminating power evolved by the combustion of 5 cubic feet of 14 to 18 candle gas in Argand burners.

But the greatest difficulty we had to contend with was the *burner*. We found, that, in order to arrive at an accurate knowledge of gases containing different proportions of luminiferous hydrocarbons, it would be necessary to have as many different standard burners as there were different qualities of gas. Now, the only accepted standard burner we possessed at that time was the Sugg-Letheby, for 14-candle gas. Although we improvised other burners for the higher and lower qualities, which were probably on a par with the Letheby burner, yet we saw clearly that, to arrive at anything like accuracy, the whole question of burners must be worked out. I undertook that work, and I have now a set of standard burners which will burn gas of from 12 to 45 candles illuminating power. It was then a generally received opinion that the greater the quantity of gas burned in one burner the greater would be the proportion between the quantity of gas consumed and the light obtained from such quantity. Thus, for example, if from a burner consuming 2½ feet of gas the light of four candles only could be obtained, then from the combustion of 5 cubic feet a light of from 12 to 13 candles could be produced with the same quality of gas. You will at once perceive that these ideas were mostly founded upon the combustion of gases of a low illuminating power, and that rich cannel gases had not been taken into account at all. If they had, it would have been found that, with such burners as those usually employed in testing gases of low illuminating power, the example given above would have been sometimes very nearly reversed.

There is every reason to suppose that practically every quality and quantity of gas can be burned to a proportionately good effect, if the supply of oxygen from the air is proportioned to the quantity of light-giving hydrocarbons in the gas. I have made ten different sizes of the "London" Argand burner. Six of these sizes give 3·4 candles light for every cubic foot of gas consumed, with 16-candle gas. The other four, which are of a larger and slightly different construction, give from 3·6 to 3·8 candles per cubic foot of gas consumed, with the same quality of gas. But if we change the quality of gas, and supply them with 20 or 30 candle gas, then the proportion of light to the cubic foot of gas consumed will be changed slightly. The smallest size will be improved, and the largest of the first six sizes will be a trifle lower. The greatest improvement, however, will take place with these centre-jet Argand burners and the double and treble flame Argand burners, because the greater quantity of oxygen supplied to them (rather in excess for the poor gas) will enable the richer gas to attain to a higher degree of incandescence.

Now, you will see from this that if we are to burn 5 cubic feet per hour of every quality of gas, as decreed by Act of Parliament, we shall require as many different standard burners as there are different qualities of gas. Therefore, for the practical gas-maker, who has to produce gas from an endless variety of coals, it is above all things important to have at hand an instrument which will fairly judge every different sample, without giving him the trouble of making a series of preliminary experiments to find out the most suitable burner for consuming the gas when he has made it. The adoption of a standard burner by mutual agreement between the gas company and the consumer, for verifying the illuminating power of the gas supplied by the one and accepted by the other, implies a knowledge beforehand, on the part of the official tester, of the illuminating power—within a candle or so—of the gas he is about to test. Even then difficulties constantly arise, from the fact that, from various causes, there are variations in the illuminating power of the gas supplied, and 5 feet of gas at one time will burn properly in the standard burner, whilst at another it smokes or is over-oxidized.

If an engineer tries coal in this manner, it is certain that the coal which comes out the best must be that which suits the standard burner, and perhaps not that which is really the best to produce the supply of gas from.

I am, however, not going to say that the official standard burner and photometer will not find out which is the best coal if a sufficient number of experiments be made to cover the errors of the candles and burner; on the contrary. But the duties of an engineer do not frequently leave him sufficient time to carry out such elaborate experiments, and the means he employs must necessarily be rapid, and at the same time *certain*.

Such a means is provided by the Illuminating Power Meter. A few minutes will show, with as great accuracy, the illuminating value of the gas, as a long day of experiments with candles.

As a proof of this, I cite the following example:—On the 31st of May last I made, by the kind permission of Mr. M'Minn, the Engineer of The Gaslight and Coke Company's station at Fulham, a day's experiment, with four different kinds of parliamentary sperm candles from the best makers in London. Eighteen tests for illuminating power were made by four different operators at the cross photometer upon the same gas. A different pair of candles was used at every test. The highest result was 17·37, and the lowest 13·92 candles. Yet all these were best parliamentary sperm candles!

At the end of the day, as a last experiment, the Illuminating Power Meter was connected to the photometer we had been using, and its indications observed. It gave as the illuminating power 16·20 candles. The average of the whole of our tests was 15·715 candles.

The Gaslight and Coke Company, Fulham Station, May 31, 1877.

Experiments to ascertain the variation in the illuminating value of candles by different makers; cross photometer used; four operators; same quality of gas all through the experiments; consumption of gas, 5·05 cubic feet per hour; temperature, 65°; barometer, 29·6; jet photometer, ·62 = 16·47; Illuminating Power-Meter, 16·20 candles.

MILLER.

Operator.	Consumption of Sperm.		Illuminating Power of Gas in Sperm Candles.
	Grains in Ten Minutes.	Grains in One Hour.	
A. C. M'Minn	37·95	113·85	16·29
A. C. M'Minn	37·00	111·00	17·37
W. Sugg	40·00	120·00	15·04
H. Jago	37·59	112·77	16·52
W. H. Edinger	38·09	114·27	15·60
Average	38·126	114·378	16·164
Greatest difference	3·000	9·000	2·33

BRECKNELL AND TURNER.

W. H. Edinger	40·32	120·96	15·48
A. C. M'Minn	40·20	120·60	16·00
W. Sugg	38·91	116·73	15·73
H. Jago	37·52	112·56	16·79
Average	39·23¾	117·71¼	16·00
Greatest difference	2·68	8·4	1·31

BARCLAY.

H. Jago	45·45	136·35	15·14
W. H. Edinger	45·52	137·76	14·64
A. C. M'Minn	42·68	128·04	15·10
W. Sugg	45·14	135·42	13·92
Average	44·79¾	134·39¼	14·7
Greatest difference	3·24	9·72	1·27

FIELD.

W. Sugg	39·29	117·87	15·89
W. Sugg	42·64	127·92	15·24
H. Jago	37·66	112·98	16·06
W. H. Edinger	39·37	118·11	14·79
A. C. M'Minn	36·93	110·79	17·26
Average	39·178	117·534	15·848
Greatest difference	5·71	17·13	2·47

Average of average, 40·33475 grains in ten minutes; 121·004¼ grains per hour; 15·678 candles illuminating power.

Average of differences, 3·03 grains in ten minutes; 8·73 grains per hour; 1·25 candle illuminating power.

Average of illuminating power, 15·715 candles.

In the month of June last I tested the gas supplied in one of the *arrondissements* of Paris with an Illuminating Power Meter similar to this, but scaled off according to the French system of testing the companies gas with a Carcel lamp. The calculations for this scale had all been made in London, yet the indications of the meter accorded within a fraction with the results obtained by the official gas examiner.

The gas made at one of the works in Liverpool has also been tested for some time with the Illuminating Power Meter, and its indications agreed with those obtained from King's photometer, and comparisons with candles.

And so at London and other places different in illuminating power, and tested by the official standards, yet the average of the tests agreed.

The principle upon which it is constructed is that the richer the gas the less the quantity of it that is required to develop a flame of 3 inches in height, the same burner and chimney being used for all gases alike.

I at one time thought that the light from the standard flame would be the same from all qualities of gas, but a long series of experiments with higher qualities of gases showed that, when the same chimney is used always, there is also an increase in the light given from the 3-inch flame as the gas becomes richer in hydrocarbons. This appears to be due to the employment of the same burner and chimney for every quality of gas. As I have before said, to develop light from different qualities of gas in direct proportions, per cubic foot, to the quantity of gas consumed, a different burner and chimney must be employed for every quality of gas, even although the flame is kept constantly at one height.

But in the Illuminating Power-Meter, as now arranged, the increase in the light given from the 3-inch flame, when the same chimney is used, and the burner is supplied with different qualities of gas, does not affect the result of the observation, and for this reason—

The rate of increase in the light having been once calculated and verified by actual experiments, the dial is corrected for that increase, and so the readings are made accurate.

The gas to be tried is admitted into the inlet of the meter, which is at the back.

A "London" Argand burner, provided with a well-made cylindrical chimney, is fixed, by means of a ground swivel joint, on the top of a pillar screwed on to a hollow rectangular base, which is firmly soldered to the outer case of an experimental meter. This base has no communication with the inside of the meter-case. That part of the pillar between the top of the base and the burner forms a cock, the gas-way of which is not drilled in the usual manner, but is slotted across the plug. The sides of this gas-way being parallel to each other, it follows that, unlike those cocks fitted with round-way plugs, the cock opens when the lever is turned by regular gradations until it is full open. A quadrant, divided into 45 equal divisions, attached to the cock, enables the operator to regulate the flow of the gas to any required rate with rapidity and precision. Above the quadrant a sighting-frame is fixed, having two upright pillars, crossed by a flat bar at one end, and at the opposite end a frame fitted with blue glass. A scratch is made across the glass exactly three inches above the solid part of the frame. The bottom of the opening, the top of the burner, and the termination of the thick part of the back columns are all on the

same level. The scratch on the glass and the bar which crosses the back pillars are also on the same level, and parallel to the three lower points just mentioned. By these arrangements the operator is enabled to adjust the height of the flame to the level of the scratch and the back bar.

It may be observed, in passing, that if some points in the flame pass the line by about one-eighth of an inch, it will make but a very slight difference to the result. There will always be small points which will look like flame, but which are only heated air. A few minutes practice will suffice to enable any one, without previous knowledge of the instrument, to adjust the height of the flame.

On the left side of the hollow base on which the pillar stands is a tube which connects the base to the outlet of a double governor. The square box on the left of the meter is the governor, which serves to maintain uniformity of pressure during the time the instrument is in use. This governor is adjusted so as to give pressure enough to make the flame tail over the chimney when the regulating-cock is full open.

On the right of the hollow base is fixed a two-way cock, with a lever ending in a knob fixed to its plug. The cock is quarter stopped, so that when it is turned in one direction as far as the stop, it is full open, and in communication with the inside of the meter, which is full of measured gas. In this position the measured gas passes through the length of the plug of the cock, and by means of a tube fixed to the end of the cock at one end, and to the inlet of the double governor at the other, it finds its way through the governor to the hollow base, and finally to the burner. While the gas is passing to the burner by this route, the measuring-drum of the meter revolves; but if the lever of the cock is turned in the opposite direction until it meets the stop, another route is opened for the passage of the gas. It then passes directly from the inlet of the meter without passing into the measuring-drum, through the length of the plug of the cock, and out by the same tube as before to the inlet of the governor, thence to find its way to the hollow base and the burner. In one position of the lever the measuring-drum of the meter is at rest, and the gas is unmeasured. The governor having been properly adjusted, and the meter having from 8-10ths to one inch of pressure at its inlet, the change in the position of the lever will not influence the height of the flame.

The index-hand is attached to the arbor of the measuring-drum, and, therefore, revolves with it, both making a revolution in the same time. The dial is divided into a number of divisions, corresponding with the illuminating power in average parliamentary standard sperm candles, of the different qualities of gas which will give a flame of 3 inches in height. Thus, if the meter is supplied with 16-candle gas, and the flame is maintained at 3 inches, the index-hand will make one complete revolution in one minute. If the meter is supplied with 12-candle gas, and the flame maintained at the 3-inch line, the hand will make one revolution and a part of another, arriving at the figure 12 in one minute. With 20-candle gas it will make less than a complete revolution in one minute, and arrive at 20. The instrument is provided with a very accurate and strong minute clock, with one pointer-hand, which makes a complete circuit of the small dial in one minute. This dial is divided into 60 equal divisions, representing seconds.

On the right of the cylinder which forms the outside case of the meter is the water-line gauge, fitted with back and front glasses. At the correct water-line these glasses are scratched across. On the top of the water-gauge is a large nut, which can be unscrewed when it is required to fill the meter or clean the gauge-glasses. The plug at the lower part of the gauge is for the purpose of running out the water, if there is too much in the meter.

In the base of the meter is a cock for the purpose of emptying all the water out of it, when it is requisite to do so. The meter should never be turned upside down for the purpose of emptying, or some water will get into the governor and connexions, and probably cause trouble. For the purpose of filling the meter, a solution of one part of good glycerine, free from acid, in three parts of distilled water, should be used.

The mode of putting it into operation is very simple. Having filled the meter up to the water-line scratched on the glass, connect it to the gas supply with a piece of metal tube. The inlet is a ground union joint, fixed in the centre of the back of the instrument. Turn the lever so as to make the gas pass through the measuring-drum, and let it get rid of all the air or other kind of gas in it. Light the burner, and adjust the flame to 3 inches in height. Then, when the large hand arrives at 16, change the position of the lever, so as to make the gas pass to the burner without going through the measuring-drum. The large hand will then stop at 16. Wind up the clock by means of the *remontoir* on the top of the meter just in the rear of the dial-ring. Start the clock by moving the slide which is on the left of the meter, close to the governor. Then, when the hand of the clock is passing any one of the divisions of the minute, change the position of the lever of the bye-pass, so as to make the gas pass through the meter. When the minute hand has made one complete revolution, stop the meter by means of the lever, in the manner before described, and read off the illuminating power. The minute clock should not be stopped either before or after the observation, unless it is desired to put the clock entirely at rest.

It will not have escaped your observation that the Illuminating Power Meter is a combination, as it were, of the Lowe Jet Photometer, the well-known duration test of Dr. Fife, and the burner part of the parliamentary test.

The meter at present before you is not precisely the kind which I have made for gases of high illuminating power produced from cannel coals. This commences at 12 candles, a standard of illuminating power which is, I think, not often seen in Scotland. The one I have constructed for Mr. King, of Liverpool, and which he has adopted for his purpose has a different dial. The standard point on the top of the dial is 20 candles instead of 16.

But, nevertheless, the scale of this meter, although fine towards the high numbers, is just as easily read as in those places where it is wider, because with the richer gases the pointer moves slower.

The Illuminating Power Meter will, I am sure, be found very useful to the engineer, but I do not think it will ever, or, indeed, can ever, be adopted as a parliamentary standard.

For this purpose I believe we must have a natural product, such as sperm oil, which is also used for producing artificial light. This has a commercial value not very fluctuating, and gas can be measured with it both for illuminating power and price.

My knowledge of petroleum oil—not very great, perhaps—does not lead me to anticipate any good results as a standard test for gas. It is a congeries of oils of different specific gravities and different illuminating powers, and it does seem difficult—I do not say impossible—to make use of such a variable material as a standard. It seems to me to resemble a standard yard measure made of india-rubber. Candles, since the days of George Lowe, have been found by all experimentalists to be very uncertain as a standard. I presume if sperm or wax candles had been found reliable, Dr. Fife would not have invented the duration test; yet I must say that it does astonish me to read in the JOURNAL OF GAS LIGHTING of the partiality for sperm candles as a standard, expressed occasionally by different writers. Dr. Letheby stated, at the Institution of Civil Engineers, in 1876, that candles had been, and were, liable to constant variations, from the manner in which the wicks were made, and from the different qualities of wax used to break the grain, as it is technically called—that is to say, prevent the sperm from crystallizing.

One of the present Gas Referees, Mr. Vernon Harcourt, says the same thing, and has proposed another standard—viz., pentane mixed with atmospheric air. I can tell you also that, of the four different kinds of parliamentary sperm candles, tested by myself and others at Fulham in May last, one maker's candles were mixed with paraffin or petroleum, and it was those candles which brought down the average of the other three kinds, so that the grand average of all the experiments showed a little lower than the reading obtained from the Illuminating Power Meter.

It is beginning to be felt that something must be done to obtain a more scientifically accurate test than candles. Gas engineers cannot, with the increasing demands made upon them, be for ever at the mercy of the sperm candle. The late Dr. Letheby, whose loss the gas world much regrets, was of the same opinion as myself—that every quality of gas should be tested by one standard burner, the quantity consumed varying in inverse ratio with the quality. This opinion is shared by Dr. Pole, one of the present Gas Referees for London, and, I believe, by his colleague, Mr. Vernon Harcourt, and by other eminent scientific chemists and gas engineers.

The constant standard quality of 5 cubic feet for every gas is practically impossible, and only leads to great inconvenience, instead of promoting a just appreciation of illuminating power.

The consideration of these difficulties naturally lead to the invention of the instrument before you. I think it will be found that not only will this instrument be an excellent guide for the engineer, but that if it is used in comparison with, say, the candles till a better standard is found, and a very useful and reliable verification apparatus will be obtained.

The manner in which I propose to use it as a verifying instrument is as follows:—The Illuminating Power Meter, with its burner and chimney, occupies one end of the photometer; at the other is placed a delicate balance, carrying two pieces of candle—a candle cut in half at the middle, and burned, one end towards the butt, and the other towards the point. By this mode the different specific gravities of each part of the candle are made to equalize each other. The candles are allowed to burn themselves into their normal state of burning, and are left slightly heavier than the counterbalance. The flame of the Argand burner is to be regulated (irrespective of quantity consumed) to a height of 3 inches. The King's pressure-gauge is to be put in communication with the foot of the standard burner, so that the slightest variation in pressure may be observed by the operator. The pressure required to give a 3-inch flame is to be noted by the operator. Then, when the candle balance is in equilibrium, the candle minute clock is to be started, and the operator drops a 40-grain weight into the candle scale.

He takes nine observations, one at the expiration of each minute. At the ninth minute he leaves the disc, and watches the candle balance; as it comes again into equilibrium he stops the minute clock, and notes the number of minutes and hundredths of a minute the candles have taken to burn the 40 grains of sperm.

He then consults a table, which has been prepared by Mr. T. W. Keates, the consulting chemist to the Metropolitan Board of Works. This tells him at a glance how many grains of sperm at such a rate of consumption the candles would have burned in 10 minutes.

The operator has then to take his tenth observation. (The candles are not blown out.) He is to add up these observations, and multiply the mean of them by the number of grains consumed by the candles in 10 minutes, divide the product by two, and the result will be the illuminating power of the gas consumed by the standard burner. Then he has to take one observation of a minute with the Illuminating Power Meter, and note the result. This observation will give him at the same time (the dial being properly divided into cubic feet and parts of cubic feet) the quantity of gas consumed by the burner, and the illuminating power of the gas at the standard rate of 5 cubic feet per hour.

The illuminating power of the gas, as determined in the first sum, has then to be multiplied by five, and divided by the quantity consumed by the standard burner per hour.

The result will be the illuminating power of the gas at the parliamentary rates of consumption of 120 grains for the candle, and 5 cubic feet per hour of the gas.

The check test of the Illuminating Power Meter will always show any variation in the standard of comparison, whether it be candles, oil, or any other suitable standard. Of course, if the present—as I think bad—system of using 5 cubic feet for every test is abandoned, this experiment will be very simple indeed. The complication is due entirely to the extra calculation involved in bringing the results up to the standard of 5 cubic feet. In Scotland it will be next to impossible to retain this standard, because the gas is too rich generally to be tried with a greater quantity than 3 feet, or 3½ feet at the outside. Therefore, the dial of the Illuminating Power Meter may be trusted to do the calculation, if it be required to know what such gas as that tested would give per 5 cubic feet of gas per hour.

In conclusion, I thank you very much for the great attention you have accorded to this paper, and I hope that what I have said may be found useful to you in assisting you to a correct estimation of the result of your labours in the production of illuminating gases. I am much pleased at the honour you have conferred upon me this morning, and shall at all times be glad to do what I can towards our mutual improvement in the common object we have in view—viz., the production of artificial light from coal gas.

Dr. WALLACE (Glasgow): It would be very unfair for me to criticize this instrument, for the reason that I have not had an opportunity of working it. It, however, appears to me that it is simply an extension of the durability test, and that the ordinary straight flame might be used for the same purpose, or a number of straight flames in a row. It also appears to me that there is greater difficulty in estimating the length of the flame with a circular burner than with a straight burner. The top of the flame is not perfectly regular—points project here and there, and though, no doubt, with practice, these might be overcome, still the beginner would have some difficulty in determining the exact length of the flame, and it is just possible that this might be found to be a serious difficulty. Single burners consume an equal quantity of gas, and they might be adopted with advantage. At all events they would give equal results. I would be glad to hear from Mr. Sugg whether he has ever thought of that, or whether he has ever experienced any difficulty with the length of the flame.

Mr. SUGG: The difficulty of using a straight jet with rich gases is just this:—Suppose you were going to use a jet for rich gases of nearly one quality, as you have them in Scotland, there will be no difficulty in producing a single jet for the photometer. Where the illuminating power varies you must have a jet for the standard quality. Then, the jet being open, the admission of air is more varied than with the Argand burner, where every passage is regulated. It is true that the points of the flame are slightly irregular; but that makes scarcely any appreciable difference in the illuminating power. The same observation as that of Dr. Wallace was made by a speaker at the Institution of Civil Engineers; but previous to that meeting ten or twelve engineers tried the meter. They

Commercial Results of Analyses made at Laboratory, Dalkeith Gas-Works, by G. F. Cusiter, F.R.S.S.A.

Date.		Name of Coal.	Gas per Ton.	Condensation by Bromine.	Durability. One Cubic Foot, 5-Inch Flame.	Illuminating Power.	Ash in Coal.
		First Class.—*Durability 60 minutes and upwards.*	Cubic Feet.	Per Cent.	Min. Sec.	Candles.	Per Cent.
1870	May 5	Not named. (James Russel and Son)	13,700	26·0	87 35	44·0	31·55
1868	Aug. 29	Boghead parrot coal	14,020	23·5	83 30	42·75	23·52
1873	Feb. 17	Woodbank cannel coal	12,250	23·9	82 40	42·5	18·20
1871	Sept. 11	Do. do.	12,500	24·0	82 37	42·0	18·04
1872	March 16	Torbanehill cannel coal	10,700	22·0	79 28	39·8	39·68
1872	Aug. 1	Not named. (M'Kelvie's)	10,700	20·0	79 16	39·4	11·60
1873	May 31	Hopeton No. 6 cleanings	9,650	19·8	76 27	39·2	Not given.
1873	June 26	Do. No. 10 do.	5,800	20·15	76 6	39·0	48·48
1872	Sept. 17	Not named. Cannel coal	7,500	19·1	73 57	38·75	49·48
1872	Aug. 13	Do. Gas coal	11,400	18·0	72 30	37·0	4·26
1870	March 26	Heavy paraffin tar oil	15,904	19·2	72 0	38·5	Not given.
1871	Oct. 11	Woodbank cannel coal	12,000	19·0	71 14	38·5	16·00
1873	June 19	Stanrigg gas coal	7,800	18·53	70 45	36·96	36·88
1873	April 10	Avonhead Musselband coal	7,400	18·4	70 35	36·95	33·76
1873	July 25	Greenhill gas coal	9,330	17·2	70 25	38·10	26·54
1872	June 21	Do. do.	9,340	16·0	70 15	38·0	26·96
1872	Sept. 2	Benbar Musselband	10,600	17·2	69 15	36·75	39·88
1872	April 27	Torbanehill cannel cleanings	9,000	18·0	68 58	37·0	35·00
1873	Oct. 6	Roadside cannel	10,600	18·2	68 30	36·0	26·08
1873	April 14	Tarbrax curly shale	5,400	17·4	68 20	36·25	63·21
1872	June 21	Rigside cannel	10,900	15·0	68 0	35·4	19·41
1869	Nov. 22	Mixture No. 1 and No. 2 Lochore parrot	11,820	16·5	67 54	34·10	Not given.
1869	Jan. 27	Lochore cannel	11,805	16·5	67 50	33·6	12·98
1869	Nov. 22	Do. No. 1 parrot	11,900	16·1	67 50	33·8	Not given.
1871	July 10	Lesmahagow gas coal (A)	12,196	17·4	67 50	35·3	5·06
1872	Sept. 28	Lillie's cannel	8,000	16·6	67 50	34·7	42·12
1871	July 10	Lesmahagow gas coal (B)	12,570	17·1	67 30	34·71	5·36
1871	April 25	Do. cannel	12,200	17·0	67 24	34·80	4·72
1871	Oct. 11	Duke of Hamilton's Lesmahagow	12,600	17·0	67 20	34·65	5·40
1871	July 10	Lesmahagow gas coal (C)	12,480	17·0	67 15	34·63	Not given.
1873	April 9	Muirkirk No. 1 cannel	11,600	15·4	66 46	34·3	2·50
1869	Aug. 20	Climpy cannel	11,900	15·4	66 44	33·20	5·34
1872	Aug. 8	Polton shale	7,500	16·0	66 27	34·0	35·60
1869	Nov. 22	Lochore No. 2 parrot	12,125	15·2	66 21	33·0	Not given.
1872	Aug. 28	Hopetown plain shale	5,510	17·8	66 9	35·1	68·70
1872	Sept. 27	Dalmeny shale	6,600	16·8	66 5	34·0	61·56
1874	Jan. 5	Boghall shale	6,220	16·2	65 50	33·6	61·98
1872	Jan. 6.	Uphall curly shale	7,300	16·8	65 41	32·57	60·92
1872	July 18	Hartwoodhill gas coal	9,600	14·4	65 38	33·5	25·45
1872	Sept. 3	Tarbrax plain and curly shale	6,300	16·9	65 20	33·0	62·22
1869	Oct. 28	Lochore No. 3 parrot	9,875	15·8	65 13	32·87	27·00
1869	Oct. 26	Blackbraes cannel	9,900	14·4	65 10	32·3	14·78
1868	Feb. 28	Airdriehill parrot	13,100	15·5	65 5	32·6	5·70
1868	April 6	Capledrae cannel (2nd class)	9,300	15·4	65 0	32·4	24·80
1873	Oct. 6	Roadside shale	8,300	16·0	64 50	32·86	40·80
1873	July 17	Not named. Gas coal	6,100	14·8	63 32	32·5	52·50
1872	Aug. 27	Do. Cannel	11,340	14·2	63 30	32·75	6·28
1870	Aug. 19	Climpy No. 2 cannel	9,900	14·72	63 2	32·3	13·12
1871	Nov. 27	Lesmahagow cannel	11,780	13·8	62 54	32·30	4·47
1871	July 1	Craignethan gas coal	12,340	15·0	62 50	32·56	5·60
1871	June 24	Woodbank cannel	11,680	14·93	62 41	32·28	15·60
1868	May 11	Wemyss cannel	12,896	14·0	62 36	31·75	15·40
1868	Feb. 29	Hamperhill Lesmahagow gas coal	11,750	13·4	62 10	30·5	6·76
1872	March 18	Cameron cannel	12,000	14·2	62 7	32·4	14·80
1870	March 16	Braidwood cannel	12,010	14·2	61 40	32·15	6·72
1872	Jan. 29	Cameron cannel	10,300	14·0	61 23	31·6	17·36
1873	July 7	Muirkirk No. 2 cannel	10,200	13·6	61 14	31·58	10·83
1868	April 18	Pollock cannel	10,520	12·0	60 51	30·82	2·08
1869	June 17	Haywood cannel	10,600	13·2	60 50	31·52	9·96
1867	July 18	Lochore parrot coal	11,493	13·2	60 44	31·5	12·90
1870	July 9	Woolmet cannel, No. 1	11,200	13·8	60 39	30·38	3·14
1871	April 29	Wee Lesmahagow cannel	12,600	13·2	60 30	30·5	2·86
1871	Sept. 28	Auldhouseburn gas coal	12,000	13·9	60 25	31·0	2·66
1870	Sept. 7	Tannochside cannel	10,000	12·87	60 4	30·0	Not given.
1872	Aug. 24	Lochgelly craw	7,800	13·0	60 2	30·0	Not given.
		Second Class.—*Durability 50 to 60 minutes.*					
1872	Sept. 2	Benbar shale	9,930	12·4	59 38	29·5	34·68
1869	Oct. 28	Lochore No. 2 parrot	11,200	12·80	59 17	29·95	12·30
1872	July 24	Lochgelly craw	8,680	12·6	59 10	29·25	Not given.
1870	Oct. 3.	Rosehall cannel	9,340	11·0	59 6	28·47	11·68
1868	July 1	Balbardie parrot	10,800	12·7	58 51	28·89	11·50
1869	April 21	Wilsontown cannel	10,810	11·95	58 50	28·41	5·22
1867	Aug. 27	Crosshill cannel	9,872	12·5	58 49	29·13	11·65
1872	July 27	Straiton gas coal	6,200	11·0	58 37	28·1	Not given.
1872	Sept. 3	Hartwoodhill gas coal	7,940	12·2	58 36	28·4	Not given.
1868	April 6	Capledrae cannel (1st class)	10,950	12·2	58 35	28·64	12·48
1869	April 30	Drumcross cannel	11,100	10·8	58 29	27·57	13·88
1868	May 19	Cleugh cannel	10,880	11·9	58 25	28·35	6·44
1868	March 17	Milnwood Lesmahagow cannel	11,850	11·7	57 29	26·87	4·21
1872	June 27	Coal from Mr. Rigg's	9,000	12·0	57 20	28·0	23·90
1872	May 7	Over-Talserf gas coal	10,300	11·0	57 20	28·0	4·56
1868	April 25	Loanhead gas coal	10,000	11·8	57 19	28·0	3·16
1872	Jan. 6.	Uphall plain shale	6,200	12·8	56 59	27·56	62·24
1870	Oct. 3	Stoney cannel, Loanhead	8,220	11·0	56 48	27·20	9·20
1872	July 17	Not named. Gas coal	10,810	11·6	56 46	27·50	7·30
1873	June 19	Trees gas coal	8,200	11·0	56 43	27·5	27·12
1873	Jan. 3	Firth cannel	8,800	11·0	56 4	27·4	9·52
1871	Aug. 5	Coal not named. (Rigg's)	7,400	11·8	55 30	26·92	12·04
1872	Oct. 17	Bathville upper cannel	9,140	11·0	55 22	26·55	23·00
1870	March 5	Windyrigg cannel	11,280	11·1	55 5	26·85	17·60
1870	March 27	Purified tar from paraffin oil	11,493	9·4	54 52	25·91	Not given.
1869	June 11	Grange cannel	11,650	10·3	54 38	26·26	5·42
1868	Aug. 28	Boghead, 1 part; splint, 3 parts	10,980	9·4	54 36	25·79	Not given.
1872	July 16	Armadale gas coal	9,250	10·6	54 33	26·35	22·58
1872	Sept. 30	Bellsdyke coal	7,340	10·6	54 32	26·3	28·52
1870	March 26	Splint, 1 ton; heavy oil, 30 gallons	12,500	9·2	54 30	25·89	Not given.
1869	July 3	Balbarhill No. 2 parrot	8,900	11·0	54 21	25·87	30·24
1872	Oct. 11	Benbar gas coal	9,170	10·2	54 17	26·16	10·69
1871	Sept. 13	Mixed do.	11,000	11·0	54 13	26·43	6·28
1873	Jan. 22	Hartwoodhill gas coal	7,760	12·0	54 12	26·25	Not given.
1867	Aug. 23	Gilmerton parrot	8,358	9·5	54 8	25·63	23·25
1873	July 9	Calder gas coal	10,000	10·2	53 55	25·95	6·80
1873	March 29	Auldhouseburn No. 2 gas coal	7,800	10·6	53 50	25·7	33·46
1873	July 17	Gilmerton gas coal	8,600	9·75	53 36	25·75	21·55
1870	March 5	Blackhall do.	10,100	9·8	53 30	23·3	6·58
1873	Aug. 15	Bathville No. 10 upper cannel	8,560	10·4	53 25	25·75	Not given.
1874	March 11	Duke of Hamilton's Home Farm parrot	10,000	10·6	53 23	24·0	10·00
1871	April 20	Blackhall parrot	10,700	9·56	53 12	24·20	6·57

Commercial Results of Analyses, &c. (continued).

Date.	Name of Coal.	Gas per Ton.	Condensation by Bromine.	Durability. One Cubic Foot, 5-Inch Flame.	Illuminating Power.	Ash in Coal.
	SECOND CLASS, &c. (*continued*).	Cubic Feet.	Per Cent.	Min. Sec.	Candles.	Per Cent.
1868 March 9	Dykehead gas coal	9,100	9·3	53 0	25·6	9·00
1869 April 21	Gilmerton cannel	9,300	9·0	52 45	24·98	6·20
1869 July 5	Newbottle great seam parrot	9,960	10·0	52 38	24·64	4·20
1871 May 29	Hartwoodhill gas coal	9,500	9·10	52 38	25·10	10·52
1867 Sept. 13	Mr. Scott's 2nd class Woodmuir	7,034	9·4	52 30	25·0	27·36
1872 Sept. 14	Wishaw gas coal	10,200	12·2	52 27	25·1	5·60
1869 Aug. 20	Donibristle cannel	10,200	9·4	51 59	23·31	Not given.
1867 Sept. 6	Fortisset gas coal	10,200	9·8	51 48	23·1	14·60
1869 Jan. 21	Parrot coal	10,930	9·5	51 46	23·59	12·34
1873 May 30	Bowhousebog gas coal	9,000	9·4	51 35	23·10	12·20
1870 March 26	Coal, 1 ton; oil, 42 gallons	13,140	Not given.	51 29	23·59	Not given.
1867 Aug. 7	Firth parrot coal	8,900	9·7	51 13	24·59	9·50
1871 Dec. 16	Ashgill gas coal	10,930	9·0	51 13	24·0	2·80
1871 Sept. 18	Auchlochan gas coal	9,800	9·2	51 5	23·6	9·50
1872 March 9	Woolmet No. 3	9,500	9·5	51 40	24·6	13·91
1870 March 26	Heavy oil	18,110	9·0	50 30	23·55	Not given.
1872 Sept. 17	Bowhousebog gas coal	9,300	8·0	50 21	21·0	12·02
1869 April 7	Dykehead Bottom	9,230	9·8	50 14	23·5	19·29
1874 May 7	Calderhead gas coal	9,560	9·0	50 10	23·2	7·84
1871 June 30	Skellyton gas coal	10,010	9·0	50 7	22·75	5·00
	THIRD CLASS.—*Durability 40 to 50 minutes.*					
1867 July 18	Shott's parrot coal	8,400	8·8	49 50	19·5	8·45
1873 June 2	Dunlop's coal	7,000	8·8	49 46	22·28	Not given.
1868 Aug. 31	Wigan cannel (sample 3)	11,202	7·0	49 38	19·75	2·60
1870 April 27	Woolmet No. 3	9,200	8·8	49 36	21·65	8·80
1867 Aug. 19	Scobie cannel	9,379	7·5	49 35	19·4	11·90
1873 June 27	Ponfeigh splint	9,800	7·6	49 29	19·5	3·14
1869 May 24	Hawkwoodburn gas coal	9,220	9·0	49 27	21·44	10·09
1873 Sept. 10	Burnbrae gas coal	10,100	7·0	49 25	20·2	9·30
1873 April 15	Auchlochan parrot splint	9,730	8·0	49 5	22·3	5·40
1868 April 18	Jerviston gas coal	9,223	7·3	48 57	23·1	4·80
1872 April 6	Quarter gas coal	9,520	7·4	48 40	20·50	Not given.
1873 March 31	Townhill cannel	9,760	7·9	48 40	22·0	3·32
1868 Feb. 18	Dykehead gas coal	9,200	7·9	48 33	21·2	10·92
1872 April 3	Killarnie gas coal	9,500	7·6	48 26	20·0	20·22
1867 Oct. 31	Hilderstone parrot	9,000	6·9	48 25	19·83	22·76
1870 Feb. 21	Carfin gas coal	10,000	7·6	48 22	19·9	20·00
1872 April 3	Quarter gas coal	9,600	6·9	48 15	19·6	3·22
1871 June 13	South Wales gas coal	9,040	7·4	47 57	19·10	9·10
1868 Aug. 8	Boghead No. 1 upper parrot	8,780	8·9	47 50	20·6	27·52
1868 Aug. 31	Wigan cannel (sample 1)	11,925	6·0	47 48	18·27	2·55
1868 May 19	Hilderstone gas coal	8,810	6·9	47 13	19·28	22·80
1874 March 11	Duke of Hamilton's Home Farm parrot and splint	9,460	7·2	46 10	19·6	6·80
1868 Aug. 31	Wigan cannel (sample 2)	11,331	5·5	45 59	17·39	2·78
1872 Feb. 24	Benbar jewel	10,100	5·8	45 36	15·34	3·16
1869 June 15	Newbottle parrot	9,860	6·0	45 28	17·28	1·19
1873 Nov. 19	Lochore Head	10,200	7·0	45 10	17·10	11·00
1873 March 31	Redding splint	10,200	5·81	45 3	16·75	5·48
1868 July 2	Wemyss coarse parrot	8,500	6·9	45 0	18·77	23·00
1873 July 17	Kirkton splint	9,500	5·2	44 48	16·12	4·64
1870 April 27	Redding splint	10,500	5·8	44 22	16·25	3·50
1867 Dec. 21	Coal from Mr. Ross, Falkirk	11,000	5·0	44 20	16·75	5·84
1874 March 12	Musselband soft	8,900	6·1	43 53	15.6	6·48
1872 April 27	Cleugh soft coal (2nd nuts)	10,400	5·0	43 53	14·85	2·92
1868 June 4	Aitken's No. 1 mid-parrot	8,925	6·6	43 46	17·22	37·92
1872 April 27	Cleugh soft (tripping)	10,000	4·8	43 45	14·79	2·92
1872 Feb. 24	Benbar Head	10,340	5·4	43 34	14·65	5·98
1873 July 19	Arden splint	10,400	5·2	43 23	14·5	4·90
1873 July 29	Crofthead coal gross	9,400	5·2	43 21	15·2	4·25
1874 March 11	Duke of Hamilton's Home Farm splint	9,140	5·8	43 20	15·2	4·20
1868 June 4	Aitken's No. 3 top parrot	7,600	6·0	42 51	17·0	30·72
1873 Sept. 30	Kiltongur soft coal (top)	11,000	5·2	42 50	15·0	2·83
1873 June 4	Grange splint	10,310	5·2	42 50	14·75	4·76
1868 Jan. 1	Avonhead Virtue soft coal	10,824	4·7	41 50	14·39	2·83
1868 June 4	Aitken's No. 2 parrot	9,500	5·1	41 29	15·82	12·32
1872 Sept. 21	Benbar soft smithy coal	10,200	4·4	41 20	14·0	1·76
1873 Sept. 30	Kiltongur soft coal (bottom)	11,100	4·6	41 20	14·3	2·20
1869 April 29	Candie coal (soft)	10,400	4·69	41 17	14·21	2·12
1871 June 3	Hartwoodhill chew	10,100	4·2	41 12	13·95	1·44
1868 Nov. 2	Limerigg splint	10,000	5·0	41 10	14·0	2·78
1870 March 26	Pulverized splint	10,000	5·0	41 10	14·0	Not given.
1868 Aug. 29	Boghead soft coal	10,000	5·0	41 10	14·0	Not given.
1872 Sept. 21	Benbar soft coal	10,500	4·2	40 39	13·75	1·36
	FOURTH CLASS.—*Durability under 40 minutes.*					
1873 Oct. 20	Cleugh soft coal (tripping)	10,000	4·6	39 50	13·83	3·20
1872 Feb. 24	Benbar diamond	10,000	5·2	39 48	13·39	2·39
1868 April 4	East plain Bannockburn soft	10,000	3·0	37 5	12·28	9·15

adjusted the flame for themselves, and tried the gas, and there was a difference of only half a candle in the whole of them. The points of the flame do not present any great obstacle. In fact, the points which are now visible are caused by draughts in the room. The instrument ought to be placed in a room specially prepared for it; and when this is done the points of the flame do not show themselves as they are doing now. But supposing a point is shown, it is easy for a manager just to put a mark on the glass the exact shape of the points, and he knows how the points present themselves, so that he has no difficulty in arranging the flame. We have now used this meter for something like three years for the purpose of testing gas. In every experiment we record we make a mark to show where the three-inch flame reaches, so that in repeating the experiment we can get the exact shape of the flame. Experiments conducted in this way, after the lapse of three years, have brought out the same results. It will thus be seen that the objection to these points does not rest on any strong ground.

Mr. YOUNG: It has given me great pleasure to have listened to Mr. Sugg, and I should now like to say a word or two. Some years ago, at a meeting of the North British Association of Gas Managers, a most interesting paper was read by Mr. Macpherson, of Kirkcaldy, on the relation between illuminating power, condensation by bromine, and durability. Had Mr. Macpherson had the privilege, which I had, of looking over the figures in the book of Mr. Cusiter, my late brother-in-law, he would have seen that, although in some gases, and I may say in the great majority of gases, there was a relation between the two, yet the relation was not always exact. Indeed, from the very nature of illuminating gases, I cannot see how the durability and illuminating power could bear relation to each other perfectly consistent, because we know that a gas may be composed of certain per centages of various gases—that is, we may have a large quantity of hydrogen in one gas, and a small quantity in another, or a large quantity of carbonic oxide in one and a small quantity in another. The hydrocarbon vapours in diffused gases have also a very different constitution, some of them having a much higher vapour density than others, and containing a much greater per centage of carbon in their constitution (volume for volume) and consequently having a higher illuminating power. It would, therefore, be quite in vain to expect that condensation by bromine and durability could bear any fixed relation to the illuminating value. If we were to curtail the supply of oxygen to the flame upon this meter, as I do now by applying a piece of tin plate to the mouth of the chimney, we immediately lengthen the flame, as you see, although we at the same time reduce the illuminating power. Now carbonic acid is the product of the combustion of carbonic oxide, and therefore I am of opinion that carbonic oxide in gas would have the same effect of limiting the oxygen. It will, of course, depend on the constitution of the gas how much the flame is affected in consequence of the carbonic oxide lengthening that flame, as the constitution of the hydrocarbons in the gas may be such as to considerably modify the action of the carbonic oxide in affecting the size of the flame. Now it appears that this is the case to a large extent, as the variations in the relation between the illuminating power and durability are never very great. I believe that the greatest differences will be found in the gases made from other materials than coal—such as the gases made from the oils derived from the destructive distillation of coal. In such gases little or no carbonic oxide is present, and consequently I would expect the durability to be much smaller in proportion to the illuminating power.

I was very much struck, in making experiments on the process originally invented by Mr. Aitken, for the enriching of gases, to find that—when employing the analyser to enrich poor coal and water gases with the hydrocarbons derived from the richer coals—durability, condensation by bromine, and illuminating power bore no relation to each other. This, no doubt, was due to the constitution of the gases. I have drawn up a statement in a tabular form of the results of close upon 200 different analyses made by my late brother-in-law, showing the illuminating power, durability, and condensation by bromine. It is as follows: [See p.p. 684, 685.] The table is so arranged that the durability successively diminishes; therefore, if the illuminating power and condensation by bromine bore a fixed relation to the durability, they should also successively diminish; but such is not the case, for I find here, with a durability of 67 minutes 50 seconds, an illuminating power of only 33·6 candles; and in another instance, with a durability of only 66 minutes 9 seconds, there is an illuminating power of 35·10 candles. Again, on the other hand, with a poorer coal, and a durability of only 52 minutes 27 seconds, there is an illuminating power of 25·10 candles, and with a durability of 53 minutes 30 seconds, there is only an illuminating power of 23·30 candles. With a durability of only 48 minutes 57 seconds, we have an illuminating power of 23·10 candles; on the other hand, with a durability as large as 50 minutes 21 seconds, we have an illuminating power of only 21 candles. In the case of a very poor coal, with a durability of only 42 minutes 51 seconds, we have an illuminating power of 17 candles; and similarly, with a durability of 45 minutes 36 seconds, we have an illuminating power of 15·34 candles. These show a considerable deviation from a fixed relation. These discrepancies may be due, as has been pointed out by Mr. Sugg, to the candle used by my late brother-in-law. Indeed, those errors may all be due to that cause, and if such is the case this instrument will be a most valuable one; but I think, in testing gases, there will be found certain discrepancies between the indication given by this meter and the photometer, though I do not think that in ordinary cases there will be any great difference. At the same time that I raise these objections, I may state I am of opinion that it is the most perfect instrument that we have for arriving rapidly at the approximate illuminating power, although I do not think it will ever be taken as an illuminating power standard, but only as a relative mode of testing or checking photometrical results. If I had had time, I intended to have brought mixtures of gases containing the different proportions of various gases, and to have added the various hydrocarbons to them, and illustrated the difference in the durability in that way. However, I am sorry I have not been able to accomplish that task. Perhaps on some future occasion I may allude again to this matter. I may say it has given me great pleasure to listen to this paper by Mr. Sugg.

Mr. Sugg: I think I mentioned at the outset that you would see that this was a combination of Dr. Vivian's duration test and a comparative testing by candles; but perhaps that escaped observation. With respect to carbonic oxide, there is no doubt if you put it into gas you will produce erroneous readings; but you must recollect that this meter is for the use of engineers. I have not tried the meter with petroleum gases. Generally speaking they range too high, and would require a burner specially adapted for them. I do not know that I have heard of this thing being tried; but a friend of mine, in connection with a gas-work in London, has tried it with petroleum gas, and he got his reading with the one gas as well as the other. I cannot, however, give this as a fact from my own personal knowledge. I do not know how he carried out his experiments. As a test for gas derived from coal, the instrument has acted very well, and to enable the engineer to ascertain what he is getting out of his coal it will be found very useful. In regard to the ordinary method of comparison with the photometer, I am perfectly sure, from observations I have made, and from the results of these observations, that this instrument supplies a standard burner to the best advantage. In the case of London, where the standard is 16 candles, if you have 17-candle gas it will not turn out so well, and if you have 15-candle gas it will destroy that gas down to something like 13, so that would be deceptive. The flame must be three inches with the "London" standard burner. If you go above or below the standard, the instrument does not give the proper illuminating power of the gas, therefore the method of using the standard burner in London is not the right way of doing it, from the fact that we are averaged to burn 5 cubic feet per hour. That is made compulsory, but in many cases it is not done, If the quantity is reduced below 5 cubic feet, a calculation is made by the rule of proportion. Then, though the Act of Parliament says that candles must burn 120 grains, nobody hesitates to take them from 118 to 135. If you never recorded any experiment, except when the candle burned 120 grains, weeks would elapse without any tests being made. I forgot to mention that we have used candles, some of which burn 108 grains, and when they burn that, the increased illuminating power per candle is very marked. When you burn up to 130 or 135, which I consider the normal quantity for a sixth-of-a-pound sperm candle, then you get a flame with a smaller amount of brown on the top. That, of course, does not give so much light as when you get 108, which gives a short, bright, luminous flame. Their difference is most marked, and therefore I think it is more important, in using candles, to keep the flame as near as possible to 120 grains.

Mr. Niven (Dunoon): Mr. Young, in the course of his observations, made some reference to Mr. Macpherson's paper in regard to the durability test for illuminating power. So far as I remember the reading of it, by taking the average of the illuminating power, Mr. Macpherson was able to find a divisor for different gases from 22 to 26 candles, and from 26 upwards he had another divisor, and he found these two divisors to be pretty accurate in arriving at the illuminating power. Mr. Macpherson showed that by taking the average there was a wonderful relation between the durability test and the illuminating power.

Mr. Stewart (Greenock): I have listened with great pleasure to Mr. Sugg's remarks upon his test-meter, and I think it will prove to be a very valuable instrument, as far as a comparative test is concerned. In Greenock we could test the apparatus very readily. We have the gas-testing office three miles from the works, and another at the works, and if we had an Illuminating Power Meter at each place, the one would check the other. In this way a valuable series of tests might be made. I think myself that, for a small work, where a man has not time to test by the photometer, and, perhaps, not a proper place for holding one, the meter will be found to be a valuable instrument for checking the gas, and will be sufficiently accurate; but, in towns where people are troubled with gas testers, it will not do to depend altogether upon it; but for most towns in Scotland it will be found amply sufficient.

Mr. Black (Old Kilpatrick): I have been working for some time with a jet, and a certain pressure. I find that with 4-10ths of pressure and a 3-inch flame you will get 28-candle illuminating power. I have tried the experiment, and it comes pretty correct. Of course, the richer the gas the higher the flame; but then you have only to add so many more 10ths to the scale, and it comes very nearly right. The only difficulty is with the chimney. I would like to get a standard chimney, so that we might arrive at the right thing.

Mr. Young: Mr. Niven has raised the question as to whether or not it was the average result of analysis which was taken by Mr. Macpherson to arrive at the relation between illuminating power, durability, and condensation. I have not the slightest doubt that was so; and this instrument is based on results of a similar description. Indeed, if you were to take the ordinary experimental meter, and, instead of putting down the durability in the shape of minutes and seconds, mark opposite, on the dial of the meter, the candle power which the equivalent durability would give, you would have this instrument; only in this instrument, instead of using a jet, you used this improved burner. In regard to the standard candle, I have had some experience, having been engaged in the manufacture of candles for six years. I am quite at one with the other speakers that the candle is not a perfectly reliable standard. If the wick happens to be strained when the candle is being moulded, the moment a light is applied the joints of the wick are drawn down, and a different amount of light is given from that afforded by a candle in which the wick has been loosely suspended. In regard to the mixing of the candle material, it is almost essential that a certain proportion of paraffin or similar matter be used to prevent the crystallization of the sperm during the process of moulding. Candles, in my opinion, are all open to variation in consequence of this cause. We have recently heard of a new test by Mr. Vernon Harcourt. He has taken one of the hydrocarbons belonging to the marsh gas series—pentane—and, by diffusing it through atmospheric air, prepares a standard gas to replace the candles. I would like to have Mr. Sugg's opinion as to that, and also as to the employment of olefiant gas for that purpose. I understand that olefiant gas has been extensively employed on the Continent, and as Mr. Sugg has had a good deal of experience in continental gas matters, perhaps he would be able to give us some information on the subject. I have always been of opinion that the standard should be formed of something which we can get perfectly pure, and used in a similar manner to the gas to be tested, and nothing can be got more readily pure, in my opinion, than olefiant gas.

Mr. Sugg: I tried some experiments a few years ago in respect of a new standard invented by Mr. Crookes, which was somewhat similar to that referred to by Mr. Young. He produced a mixture of benzole and alcohol, and he burned that in a flame with a platinum wick. I tried the lamp, and I found that the variations were greater than the variations of the candle. The light was only equal to half a candle, and when we multiplied the results we found the variations very great. That variation was due to the deposit on the wick of a gummy kind of matter, which prevented the wick from giving its proper light; but still, use it as you would, there was a difference between the results given at one time and another. Although the same quality of gas was always tried upon it, we could never get the same result, no more than we could get it from the candles; so I was not disposed to look at that invention with any great favour. I cannot say anything about the system devised by Mr. Harcourt, because I have not tried it. A gentleman in London, however, told me that he had tried the invention, and that he had obtained very good results. He takes pentane—a product obtained by condensing petroleum—and mixes with it a certain proportion of atmospheric air in a gasholder. The mode of operation is to pull up the gasholder to a certain height, and then to turn pentane into it. This flows on the surface of the water, and gives itself off in vapours. The gas he burns on two brass tips, representing candles. They are about 1¼ or 1½ inch separate. There are two holes in the tip, nearly a quarter of an inch in diameter, and from these you burn two jets of flame, and they represent the candles very well; but whether that can be adopted as a permanent standard, I cannot say. I do not think it can. A manufactured article like that would require to be manufactured by an official tester, who would always be inclined to make his pneumatic gas in his own way, so that he would have more trouble than at present. I think the tester prefers to have nothing to do with the article by which he is testing the illuminating power of gas.

Dr. Wallace: As an official tester of gas at four stations in Glasgow, I have a good deal of experience in the burning of candles, and I find them to be, on the whole, tolerably consistent in their rate of burning at one time with another. A good deal depends on the length of time you burn a candle, and I make it a point in testing gas to light the candle in such a way as not to melt the oil all away. Then I let it burn for ten minutes before I begin to test. If you allow it to burn an hour or an hour and a half, you will get a different test. Then, for testing burners, I use a gas standardized first from candles. I have a jet of gas provided with a separate meter, a separate pressure-gauge, and a separate governor, and I bring an arm of it exactly into the place of the candles. It is brought in so that it shall be exactly equal to two candles, and if you have the same gas burning all day you have practically two candles, and you are sure that the results are the same all through. I think by a little care in using candles they form a standard not quite so bad as it is called by some. At all events I have found mine pretty consistent. For instance, the gas is tested on the works at Dalmarnock, and at a station 1½ or 1¾ mile away, and the consistency is to about a quarter of a candle. Of course, in severe weather there will be more lost. In regard to Mr. Crookes's lamp, my experience coincides with Mr. Sugg's. I tried it, and gave it up as worse than candles. In regard to Mr. Harcourt's test, I have not had an opportunity of trying it; but I am afraid that it is too delicate a thing for ordinary gas testers to use. Many of these gas testers are not men of such high education that they might not make a slip in the preparation of the mixture, and a slight defect in the quantity of pentane, or excess in the quantity of air, would make the test more apart from truth than the ordinary candles. I could approve of the use of sperm oil. I think it could be more reliable than sperm candles, and I should be glad to see the day when we could give up using candles and adopt sperm oil. The great evil we have to contend with is that gas testers will not take the trouble that is necessary when using candles. With oil there could not be the same difficulty.

On the motion of the President, a cordial vote of thanks was accorded to Mr. Sugg for his paper.

(To be continued.)

The Water Supply of New York.—The New York correspondent of the *Philadelphia Ledger* writes on Oct. 4: "The long wished-for rain has come at last, but in such infinitesimal doses as to still leave it a matter of uncertainty whether the drought is at an end. The Croton Water Commissioners do not hesitate to say now, we have been in greater danger of scarcity of water than it has been prudent heretofore to state, but they are inclined to think the present rainfall will develop to such proportions as to fill the Westchester streams and replenish the exhausted reservoirs. This assurance is a great relief to the fire insurance people, who for some time past have been afraid of a conflagration breaking out while we had no adequate means at hand for extinguishing it. The underwriters are uniting in a strong appeal to the Mayor to urge upon the Common Council prompt action with reference to an increase of our water supply. It will cost a great deal of money to construct additional reservoirs, but they think it is poor economy that thus saves a dollar, as it were, while risking the loss of thousands. The present city government have adopted a policy of reducing the city debt as much as possible, and it also stands committed against undertaking new public works; but the underwriters, while commending the policy, are prepared to prove that in this case it is not an extravagance, but a matter of economy, to spend freely."

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

In almost every branch of business the operations of the past week have been devoid of special interest, and in all departments of the local iron trade matters have remained very dull, with an accumulation of stocks in all directions, which has had the effect of keeping prices down. Forge pig iron has not been selling at all freely, nor have the transactions in general brands of foundry pig been on even a medium scale. Some few of the larger Derbyshire and South Yorkshire smelters are fairly well engaged in reducing local Lincolnshire and Northamptonshire ores, but they are, for the most part, able to use up the greater part of the output of their blast furnaces in their own establishments. The finished iron branches are also very dull, and it is typical of the general situation that the Northfield Iron Company, Limited, should have been compelled to suspend payment, and also that the shareholders of the Parkgate Waggon Company, Limited, should have thought it necessary to wind up their undertaking voluntarily. It is quite certain, at all events, that for a long time past, the finished iron trade hereabouts has not paid, so that it would not be surprising to find that some of those at present engaged therein should determine to abandon it, temporarily at all events.

The coal market is, on the whole, rather quieter than when my last report was penned, owing to the closing of the Baltic shipping season, by which a large quantity of hard coal is thrown upon the home market. Some of the local coalowners now have a good deal of difficulty in getting rid of this hard coal, whilst many of them, on the other hand, cannot dispose of the small stock. In spite of these difficulties, however, some of the coalowners, with pits close to Sheffield, are understood to intend to increase their prices on the 1st of November.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A few odd inquiries for gas coal continue to crop up now and then, and during the past week, one or two of the large Manchester firms have received several applications for contracts, but the amount of business doing in this branch of trade is very small. With regard to cannel also there appear to be a few consumers who have not as yet covered all their forward requirements. So far as prices, however, are concerned, there is little or nothing to report except that the market is still very low, as there is a good deal of gas-making coal in the district which has not yet been placed, and which will apparently have to be disposed of for house fire purposes during the winter months. The house fire coal trade exhibits rather more activity, and in the Manchester market, prices have a tendency towards stiffness, but generally throughout Lancashire the improvement is not yet sufficiently marked to materially affect values, and as supplies are still fully equal to the present demand, and could be readily increased to meet any extra push in the market, buyers who are prepared to buy quantities are able to place their orders on favourable terms. For manufacturing classes of fuel the demand is still very limited. Common coal is very difficult to sell, and burgy and slack are more plentiful in the market, with extremely low prices being accepted for the inferior sorts. The average quotations at the pit mouth may be given about as under:—Good ordinary Arley, 10s. to 10s. 6d. per ton; Pemberton four-feet, 8s. to 8s. 6d.; common coal, 6s. to 7s.; burgy, 5s. to 5s. 6d.; good ordinary slack, 4s. to 4s. 6d.; and inferior ditto, 2s. 9d. to 3s. 3d. per ton.

The iron trade continues in a very depressed condition, and business is almost entirely confined to a few speculative inquiries for common iron delivered into next year at the present low rates. Lancashire makers of pig iron are doing only a very limited business, but they seem to have touched the lowest limit so far as prices are concerned, and there is no disposition to make further concessions to secure immediate business, or even to accept forward orders at present rates, which remain firm at about 51s. per ton for No. 3 foundry, and 50s. for No. 4, less 2½ per cent., delivered into the Manchester district. The finished iron trade shows no improvement, and list rates in some classes of iron, which, at the recent quarterly meeting it was thought would be maintained, have been reduced to about the level of the previous actual selling prices, which for Lancashire bars delivered into the Manchester district may be given at £6 10s. per ton, with other descriptions in proportion.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of coals from the Tyne Dock during the past fortnight have amounted to very close upon 170,000 tons. This is a very heavy export. The principal shipments have been gas, house, manufacturing coals, and coke. Gas coals have been the largest shipments. The gas coal trade, though it can hardly be described as in a very actively vigorous condition, is steady. There are undoubtedly more coals, especially second class, in the market than there is an absolute demand, but they are got away. The best qualities range from 8s. to 8s. 6d., a very good medium sort from 7s. to 7s. 6d., and inferior from 6s. to 6s. 6d., with the usual 2½ per cent. discount. The market is so uncertain that the prices at which coals are bought are entirely a matter of agreement between the colliery offices and the purchasers. No absolute quotations can be given; but the range of prices is as described. The steam coal trade, especially for a good medium quality sold at about 10s. 6d. per ton, is a little stronger, and during the week the trade has not pressed so heavily upon other businesses. The masters are getting affairs adjusted with the men, so that the pits may be wrought more economically, which is a great gain to the former. House coals are pretty steady. They are sold at from 11s. to 12s. 6d. best, and 10s. to 10s. 6d. seconds, free on board ship; small coals for local consumption are not inquired after, and are low in price. But the rates are no worse than they have been for three or four months past.

The smaller gas companies in the South of England and the east coast continue to make up their stocks for winter. Small sailing ships, therefore, suitable for the bye-ports, are in demand at a slight increase of freight. As a rule, however, sailing-ships of that class have been chartered before they came north. The rates for collier brigs to load coals for London, to be delivered at the wharf, were lower by from 3d. to 6d. per ton last week than in the previous week. A fair business was done to France, and steamers have been engaged to load coals for the Sound ports at an advance of from 5s. to 10s. per keel. The steamers engaged in the coasting trade, which have not been running for a series of voyages, command from 4s. 6d. to 4s. 9d. per ton for London river. The other branches of the shipping trade of the North are without change. The somewhat unusual circumstance of pretty considerable orders for gas coals having been sent from Boston and some of the eastern cities of the United States to the Tyne this autumn has been noted previously in this column. Some more orders have come from Boston and Philadelphia for gas coals, if steamers can be procured at a somewhat lower rate of freight. With the late quotations in freight, and the comparatively lower price of the article placed on board ship, the American gas companies on the Eastern seaboard have been able to buy British gas coals at a cheaper price than the coals of their own country.

The manufacturing business of the North of England is unchanged. It is very dull. The prospects of the iron trade of the Cleveland district do not improve as the winter months draw on. They are not at all good, and after the Baltic is closed the shipments of pig iron from Middlesbrough will show a falling off. The chemical business is flat.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The price of gas in Thurso has been reduced to 7s. 6d. per 1000 cubic feet. Henceforth the local gas company will not need to be in a state of trepidation regarding the threat of the townspeople to resort to the use of paraffin oil as an illuminant instead of coal gas.

Owing to the satisfactory state of the Aberdeen Corporation gas accounts for the year, the Gas Committee of the Town Council have agreed to recommend that a reduction of 2d. per 1000 cubic feet be made in the price of gas. The proposed reduction will bring the price down to 4s. 5d. per 1000 feet, which is certainly a very moderate charge for gas in a town which is so far from the supply of gas coal.

As the winter season approaches, the quality of the Glasgow Corporation gas is beginning to undergo a general improvement, During the week ending Oct. 20, according to Dr. Wallace's report, the illuminating power was in no instance below 25·78 standard candles, while at three of the testing-stations the minimum ranged from 26·37 candles to 26·96 candles. Over the four stations the maximum illuminating power ranged from 27·60 to 28·06 candles, and the average from 26·74 candles to 27·63. In all cases the highest results were got at West Street station.

It is reported that the Glasgow Corporation Gas Committee have not yet secured all their coals for the current year, and that the convener of the committee has resolved that several well-known firms of coal merchants will not, in the meantime, be asked to undertake any new contracts in consequence of their alleged connection with a "rig" which is said to have been established in Glasgow, in the gas coal trade, within the past few months.

While speaking of gas coal I may mention that several new "finds" of rich gas-yielding mineral have lately been announced, one of them being very like the famous Boghead coal of fifteen or twenty years ago. It is said to yield 14,080 cubic feet of gas per ton, the illuminating power of which is 41·28 standard candles, while the resulting coke, instead of being useless, contains only 16½ per cent. of ash. I have just been informed that a basin of about 30 acres of the genuine Boghead coal has just been proved on the Bathville Estate, which is coterminous, if I mistake not, with that of Boghead. Indeed, some of this coal has got into the market this season, a lot having been shipped abroad recently, the price of which was 86s. per ton. Previous to this sale, I must confess that I had never heard of a higher price than 84s. per ton being paid for this mineral.

The official report upon the Aberdeen Water-Works for the month of September shows that the total consumpt of water in 24 hours, from the low service and high service reservoirs, was found to be 4,178,500 gallons, of which 4,010,800 came from the former. The smallest consumpt from the low service reservoir is between the hours of nine p.m. and six a.m., the average per hour being 133,200 gallons. Between six and seven a.m. the consumpt rises to 162,800 gallons, then by nine a.m. it reaches to 177,600 gallons, increasing between nine and ten to 207,000 gallons, and in the following hour to 222,000 gallons, the highest point of consumpt which is reached in the 24 hours.

Rapid progress is being made with the new water-works for Wemyss, in Fifeshire. The reservoir, which is at a height of 314 feet above Ordnance datum, is calculated to hold 50 million gallons, and the supply aimed at is 30 gallons per head per day for a population of 8000. The sum of £20,000 has been voted by the Public Works Loan Commissioners for carrying out the undertaking, and it is to be repaid, principal and interest, in 50 years. It is expected that the first water-rate will be about 8d. per £1 of rental on owners, and 6d. per £1 on occupiers. Mr. Sang, C.E., Kirkcaldy, is the engineer; and the contractor for the whole works is Mr. Mackenzie, of Gallatown.

The Motherwell Water-Works, which have been in course of construction for about two years, were formally opened on Thursday. The gathering-grounds, extending to about 650 acres, are at a height varying from 1000 to 820 feet above the sea level, and the reservoir is constructed to contain 20 million gallons, or equal to a supply of 25 gallons per head per day for 114 days, to a population of 7000, without any water flowing into the basin. In constructing the filters ample allowance has been made for a reasonable increase of the population. It is not expected that the cost of the works, exclusive of the price of the land, will exceed £14,000; but the engineer's estimate, made when iron and wages were higher, was £15,000.

Another movement has just been made with the view of securing an improved water supply for Lennoxtown, an important manufacturing village about ten miles to the north of Glasgow. Mr. W. R. Copland, C.E., Glasgow, has been engaged as the engineer.

New water-works are about to be commenced for Burghhead, parish of Duffus, Elginshire.

Drainage works, for the prevention of the pollution of the river Leven, Fifeshire, have been resolved upon, the probable cost of which will be about £26,000. Instructions have been given to promote a Bill in Parliament next session for authority to carry out the proposed works.

Last week's Glasgow pig iron market was again extremely dull. The closing prices on Friday afternoon were—sellers, 52s. 5d. one month, and 52s. 2d. cash. Buyers very near.

No change can be reported in the condition of the coal market.

GAS AFFAIRS AT HALIFAX.—At a special meeting of the Corporation of Halifax, on the 22nd inst., the Mayor (Alderman Whitley) entered at great length into the question of the financial position of the borough, and his reasons for dissenting from the decision arrived at by the council to reduce the price of gas from 3s. 8d. to 3s. 4d. He urged upon the council, at their next meeting, to rescind that resolution, and to send back all the estimates, for the coming year, to their respective committees, for reconsideration. This proposition gave rise to much discussion, and a motion to carry out the views expressed by the Mayor was rejected by a majority of 10. The following resolution was, however, adopted:—"That the estimates of the Gas Committee be amended by suspending the sum of £3000 set apart towards the renewal account until the close of next year, and that should the finances of the borough then prove more satisfactory than the whole of the estimates now submitted, the excess be applied, so far as the same will extend, in paying the £3000 on renewal account."

PROPOSED PURCHASE OF THE STOKE GAS-WORKS.—A public meeting of ratepayers of the borough of Stoke was held on the 23rd inst., called by Alderman Copeland, the mayor, upon a requisition of twenty-two ratepayers, to consider, and, if thought fit, to approve of and give consent to the promotion of a Bill in Parliament, in the ensuing session, for acquiring by agreement the gas-works and undertaking of the Stoke and Fenton Gas-Works Company, and for conferring upon the corporation all such powers as might be deemed necessary for carrying into effect the purpose stated, including the raising of the requisite funds; and that the

expenses connected with the promotion of the Bill be charged upon the general district rates of the borough. The chair was occupied by Alderman Keary, and the proposition for purchasing the works, and the negotiations which had been carried on between the company and corporation, were submitted at some length, and with much clearness and ability, by Mr. Turner. The terms agreed upon are the payment in cash of £85,000, for which sum the company will transfer the whole of their undertaking, and all the rights and privileges attaching thereto. The paid-up capital of the company is £34,000, there having been an expenditure of £10,000 of profits on capital account. The profits last year were £5725, so that the sum to be paid for the works is less than 15 years purchase of the actual profits, though it represents 25 years purchase of their parliamentary dividend. The proposition to purchase the works was carried with a few dissentients.

The New Gas-Works at Bilston.—For some years past the directors of the Bilston Gas Company have found it difficult to meet the demands of their customers, owing to the smallness of the gasholder storeage at their works. This storeage did not exceed 130,000 cubic feet, while the supply required was considerably over 300,000 cubic feet every 24 hours. The impossibility of increasing the gasholder storeage at Moxley, and the fact that the works were not in direct communication with either canal or railroad, led the directors to consider the advisability of erecting entirely new works where these difficulties could be overcome. After anxious deliberation this course was resolved on, and in accordance with this decision a piece of land ten acres in extent at Milfields was obtained, possessing canal frontage and communication with the Great Western Railway. The works were commenced in the spring of last year, and though not yet complete in all details, they are sufficiently advanced to be available for work, the first supply of gas to the town having just been sent down the new mains. The works consist of a retort-house 107 feet long, with through retorts, capable of producing 600,000 cubic feet of gas every 24 hours, or nearly double the capacity of the old works. The coal stores are arranged so that the coal will be delivered in railway trucks in front of the retorts, where the siding is connected with the main line of railway. There are four purifiers, each 16 feet square, constructed on a new principle by Messrs. C. and W. Walker, of London, which have many advantages over the purifiers in use at the works at Moxley. For freeing the gas of ammonia, a scrubber, 10 feet in diameter and 55 feet high, tower shaped, has been supplied by Messrs. R. Dempster and Sons, of Elland, near Halifax. The tank which contains the gasholder is 101 feet 6 inches in diameter, is formed of brick with puddled bottom and sides, and was made by Mr. Henry Lovatt, of Wolverhampton, while the gasholder, which is telescopic, was constructed by Mr. D. Howard, of West Bromwich. The gas supply, on leaving the holder, is regulated by a contrivance called a governor, which will check the supply to the town. When finished, the works bid fair to be among the most substantial and convenient in the county; and the directors are to be congratulated on having so far carried an important and difficult enterprise to a successful conclusion. The old works at Moxley will, on the completion of the new works, be entirely closed.—*Wolverhampton Chronicle.*

The Alliance Gas Company and the Corporation of Dublin.—At a special meeting of the Municipal Council of Dublin, on the 22nd inst., the Lord Mayor presiding—a letter was read from Mr. W. F. Cotton, secretary of the Alliance and Dublin Consumers Gas Company, in reference to the gas engineer's expenses, stating that the directors, having taken into consideration the unpleasant position in which gas engineers were placed with respect to their claims against the corporation, and it having been ascertained that as a body they were not liable; yet, as representing the citizens, on whose behalf the engineers were employed, the directors felt that morally the members were responsible, and that, therefore, for the honour of the city, they should also contribute towards those gentlemen's expenses, particularly as the Chamber of Commerce and others of the leading citizens had come forward and signified their intention of doing so. In this sense the directors desired to state that they were willing to subscribe a sum of £250, upon the express understanding that the members of the corporation join the citizens in raising a sufficient sum to pay the claims, which have been reduced to a small amount by the claimants. Sir John Barrington said that these engineers had now reduced their claims to under £1200. The sum to be subscribed was about £750, and he suggested that each of the members of the council should now subscribe individually a sum of £5 each, for the honour of the corporation, in order to aid in defraying the expenses. Mr. French protested against this course. Alderman Harris said he could not understand how or why the members of the council were to put their hands in their pockets to subscribe for the payment of gentlemen to instruct the gas company how to carry on their business. He had understood that the gas company were to give £500 towards the fund for the payment of these expenses, and he did not know by what extraordinary cheeseparing the amount had been reduced. The gas company had obtained all the profit in the matter, and he thought they should pay £1000 towards defraying the expenses. Alderman Gregg said that the corporation, as representing the citizens, had employed these engineers to come over and give an honest account of the matter as regarded the Alliance Gas Company, and they had done so. They did so; and the corporation should feel that they owed the money honestly earned, and he thought that it would be a disgrace to the corporation if these gentlemen were not paid, in consequence of some figment of the law. He had himself collected a couple of hundred pounds from Messrs. Pim, Plunkett, Todd Brothers, and other merchants, but the gas company said that they did not feel that they ought to give what they offered unless more money was raised. After some further discussion, the letter was referred to a committee of the whole House for consideration.

Register of New Patents.

2354.—Beckett, F. R., Chelmsford, "*Improvements in the construction of valves for regulating the flow of steam, water, gas, or other fluids.*" Patent dated June 6, 1876.

This invention relates to a valve so constructed that its working or wearing parts are arranged in a small detached portable box or barrel, which is fitted into a short length of pipe, and secured by a screw fixed in the bottom of the box. The screw passing through a hole in the bottom of the pipe is firmly fastened in its place by means of a nut. By this arrangement the working and wearing parts of the valve can be taken out and replaced without disconnecting the pipes or apparatus in which the valve is fixed. In addition to this, the disc or valve plate is made self-adjusting by passing through a slot in the spindle, and being fixed by means of a screw or bolt in its centre, thereby allowing it to adjust itself to its proper seating.

2360.—Schnell, J. F., Castleford, "*Improvements in lamps and burners, and in the means or apparatus employed for generating gas for the same from benzoline for illuminating purposes.*" Patent dated June 6, 1876.

The object of this invention is to provide a lamp for dwelling-houses and other places, also to render benzoline safe for use in these lamps, and to provide a simple means for extracting gas from the same for illuminating purposes.

The apparatus consists of a cylinder filled with chloride of lime and a quantity of copper wire. On the top of the battery one or more tubes are mounted, the upper part of which may be perforated with any required number of holes. By preference, a piece of copper wire is passed up each of the tubes to where the perforations are, and on heat or a light being applied to the top of the tubes it is conveyed through copper wires to the battery. The heated copper wire, in conjunction with the chloride of lime, causes the gas to rise or generate from the benzoline. Previous to using the benzoline, saltpetre is mixed with it, which assists in purifying the gas generated, and renders the light much clearer and free from smoke. The upper portion of the tubes may be varied in form, and in some cases are provided with flanges above and below the perforations, for the purpose of spreading and protecting the light or flame. In some cases an ordinary fantail or other burner is employed.

The invention further consists in the means or apparatus employed in the manufacture of gas from benzoline, and consists of a retort, a portion of the interior of which is filled with chloride of lime and cotton wool, or its equivalent. Into the other part of the retort prepared benzoline is allowed to flow from a tank placed in a suitable position. Under the retort a fire is provided, which heats the benzoline as it passes thereinto so as to cause it to evaporate and to fly off in the form of gas through the chloride of lime and cotton wool, thence through suitable tubes to a filter containing water. It is then passed through a succession of cooling pipes or tubes, from which it can be conveyed through piping to any required point, and used in the manner of ordinary gas.

2374.—Dann, J. T., North Brixton, Surrey, "*Improvements in the construction of apparatus for lighting, extinguishing, and regulating gas flames.*" A communication. Patent dated June 7, 1876.

This invention has for its object to secure increased efficiency in the working of such diaphragms or floats as are applicable to various descriptions of apparatus for the automatic lighting, extinguishing, and regulating of gas flames.

The first part of the invention consists in connecting a ratchet-wheel or equivalent mechanical organ with the diaphragm or float, in such a manner that upon its rising the ratchet-wheel is acted upon by its pawl (or the other mechanical organ by its corresponding ancillary link) and thereby part of a revolution is effected, or a certain angle described by the ratchet-wheel. There is further provided a series of radial or segmental arms separated from each other by deep angular grooves or interspaces, and so connected with the ratchet-wheel as to be actuated by its motion. A pin, or other kind of stop, is fixed to or connected with the diaphragm or float in such a manner that, upon its re-descending a certain distance, the pin or stop comes to rest upon one of the radial or segmental arms, or one of these arms comes to rest upon the pin or stop, thereby preventing the diaphragm or float from continuing its downward motion. Upon the pressure increasing, the diaphragm ascends again, and in so doing causes both the ratchet-wheel and the radial arms to perform such a part of a revolution, or describe such an angle, as to bring the pin or stop within the groove or interspace between the radial arms, as soon as the diaphragm or float descends again, thus admitting of its going to the extreme limit of downward motion. By this means the main burner is ignited at a certain increase of pressure, its extinction is prevented at any fall of the pressure, and it is extinguished only after the pressure has been raised and lowered a second time.

The second part consists in providing a hollow prismatic slide working upon or within a guide-piece, or being worked upon by a guide-piece of corresponding angularity, and fitted to or connected with the diaphragm or float. This prismatic slide and its guide are furnished with channels or orifices communicating with each other in such a manner as to cause the main flame and an auxiliary flame to be lighted reciprocally and alternately in accordance with the requirements of the consumers.

The third part consists in preventing the overflow or spilling of the mercury, or other liquid, in the groove within which the float or diaphragm, acted on by the pressure of gas, is dipped in some self-lighting gas apparatus. To effect this, the inside of the groove is so indented as to compel the mercury or other liquid on rising to enter the recess, and in its natural course drop again into the groove instead of overflowing the top edge.

The fourth part consists in coiling a platina thread or wire around an auxiliary burner, constructed so as to vary the size of its flame in accordance with the shifting positions of a hollow slide or tube, so that by the heat preserved within the coil the auxiliary flame may be re-lighted after being extinguished through some accident.

The fifth part consists in fitting a hood or globe, made of glass or other transparent material, over the whole or part of the apparatus, for the purpose of protecting such parts as might otherwise be exposed to the injurious effects of atmospheric or other external influences.

APPLICATIONS FOR LETTERS PATENT.

3867.—Wirth, F., Frankfort-on-the-Maine, Germany, "Improvements in the manufacture of hydrated peroxide of iron, and various colours." A communication. Oct. 19, 1877.

3870.—Pearn, F. and S., Manchester, "Improvements in steam-pumps, and in valves used for pumping water, air, and other fluids." Oct. 19, 1877.

3872.—Hudson, J. C., Brixton, Surrey, "Improvements in safety or relief valves, and apparatus connected therewith, chiefly designed for steam-boilers, fire-engines, and force-pumps, or other apparatus containing fluid under pressure." Oct. 19, 1877.

3876.—Pitt, S., Sutton, Surrey, "Improvements in producing, purifying, and regulating gas, and in apparatus employed therein." A communication. (Complete specification.) Oct. 19, 1877.

3900.—Thompson, W., and Maw, G., Sheffield, "Improvements in means and apparatus for generating heat by gas and air, applicable to stoves and other purposes." Oct. 22, 1877.

3919.—Anderson, W., Erith, Kent, "Improvements in the construction of ball and other taps." Oct. 23, 1877.

3922.—Dewrance, J., Borough, London, "Improvements in cocks." Oct. 23, 1877.

3942.—Vaughan, E. P. H., Chancery Lane, London, "Improvements in pumps for sucking and forcing water and other fluids." A communication. Oct. 24, 1877.

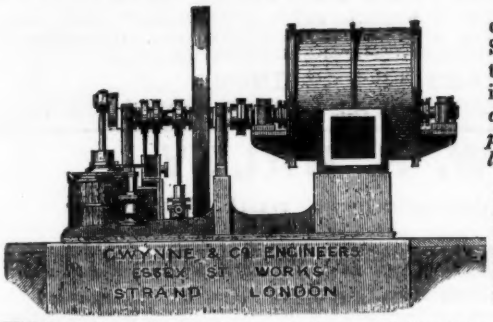
3943.—Sallien, L., Brussels, Belgium, "An improved apparatus for filtering liquids, applicable also to other similar purposes." (Complete specification.) Oct. 24, 1877.

3953.—Warner, W. J., South Shields, Durham, "Improvements in machinery and apparatus for charging and discharging gas-retorts." Oct. 25, 1877.

3956.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in hydrants." A communication. Oct. 25, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;
Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

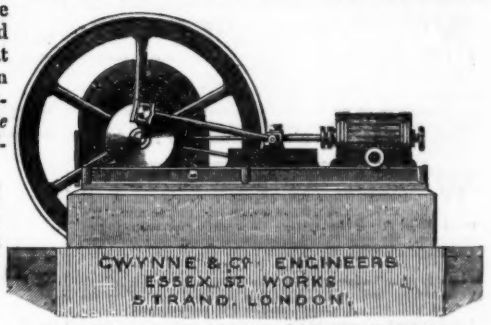
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure.
Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.**, Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

☞ *G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines, with many others of all Sizes*

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D. BRUCE PEEBLES & CO.

Beg to announce that they have REMOVED to their New Premises,

TAY WORKS, BONNINGTON, EDINBURGH,

To which all communications should now be addressed:
May 30, 1877.

Now ready, price One Shilling, No. 12 (*to be continued Monthly*) *of*

A TREATISE ON THE SCIENCE & PRACTICE

OF THE

Manufacture and Distribution

OF

COAL GAS.

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OR OF ANY BOOKSELLER IN TOWN OR COUNTRY.

For the convenience of persons resident in remote districts, arrangements have been made by the Publisher to forward the "Treatise" by Post, securely packed, at the cost of 1s. 2d. Monthly, or 7s. for the Half Year.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
STATION-METERS, GOVERNORS,
PRESSURE AND EXHAUST REGISTERS,
LAMP-METERS IN CAST-IRON BOXES,
And every Description of Gas Apparatus.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)
SUPPLY FROM STOCK
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.
All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

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OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

WANTED, the Management of a small Gas-Works, or as a GAS-FITTER. Main and service laying. Fourteen years character.
Apply to Mr. H. MANNING, Gas-Works, Hythe, KENT.

WANTED immediately, a good Fitter, used to outside service and main work. Good wages for an experienced steady man.
Apply, by letter only, to No. 410, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, an Assistant METER INSPECTOR. Must have a thorough knowledge of meters and fittings.
Apply, by letter only, to No. 411, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady, first-class Main and SERVICE LAYER (none other need apply). Constant employment.
Address No. 413, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WIGAN CORPORATION BOROUGH GAS-WORKS.
WANTED, Gas-Fitters. Permanent occupation for good workmen. Accustomed to inside and outside fitting.
Apply to Mr. HAWKINS, Gas-Works, WIGAN.

WANTED to Purchase, two Second-Hand Iron TANKS (Wrought or Cast). One to hold not less than 5000 gallons, and one to hold about 300 gallons, delivered at Uxbridge Station, G.W.R.
Address COTTON AND MARDON, Gas-Works, UXBRIDGE.

WANTED, a Carbonizing Foreman in a Gas-Works where the make is upwards of 100 million cubic feet per annum. Must understand exhausters, have had experience, and be able to control men.
Apply, by letter, to No. 414, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the Address of Gas Companies who have not received a Copy of the New Edition of PAMPHLET for GAS COMPANIES to distribute to their Gas Consumers—"Cooking and Heating by Gas." Price £6 for first thousand. Copies by post Threepence—direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

WANTED, by a Young Man, the son of a Gas Engineer, a situation as ASSISTANT in a large Gas-Work, or as Manager of a smaller one. Is a good draughtsman, has a knowledge of chemistry, and is quite competent to take charge of a work. Can be well recommended.
Address No. 415, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREIGN GAS-WORKS.
NOW open to an engagement, an English ENGINEER, who has had 20 years experience in the Erection and Management of Gas-Works. During a professional residence of 15 years in France, Spain, and Italy, has acquired a thorough knowledge of the languages.
Address R. T., care of Matheson and Grant, 32, Walbrook, LONDON, E.C.

WANTED, the Management of a small Gas-Works, by one thoroughly competent in the manufacture and distribution of gas; also in the erection of Retort Benches and all fittings for the same, having had a long experience in both London and Provincial works. References on application.

Address No. 409, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

WANTED, an experienced Working MANAGER to take charge of a small Gas-Works where the make is 5½ million cubic feet per annum. He must understand the setting of retorts and repairing of furnaces. He will be required to lay mains and services, and inspect meters, &c. House, coals, gas, water, and rates free.

Apply on or before Monday, Nov. 5th, with references as to character and ability, and stating age, and salary required, also when at liberty, to the SECRETARY, Gas-Works, Cleator Moor, CUMBERLAND.

FOREMAN STOKER Wanted—Make 5 million cubic feet per annum. Will have charge of the works. Wages 25s. per week, with house, coal, and gas free.

Prompt applications, with recent testimonials, may be addressed to F. J. COLLINGWOOD, Civil Engineer, RHYL.

THE Advertiser is desirous of meeting with an appointment as MANAGER or ASSISTANT MANAGER of a Gas-Work (having managed successfully a Gas-Work where the make was close upon 100 millions per year), or a situation in a Gas Apparatus Manufactory. No objection to go abroad.

Address J. H. LYON, 24, Park Street, MACCLESFIELD.

A Firm of Coal Merchants near London wish to represent a good Colliery in both House and Gas qualities Being practically engaged in gas-making, they would be able to push Gas Coals, and are prepared further to undertake Commissions for anything used in Gas Manufacture.

Address No. 412, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS, GAS APPARATUS MANUFACTURERS, CONTRACTORS, &c.

A Gas Engineer, aged 30, who has been engaged as Assistant Engineer in the erection of Gas-Works in five large towns during the last ten years, is open to an engagement. Is a good draughtsman, a competent analyst, and is well acquainted with the manufacture of ammoniacal salts. An engagement which might lead to a future partnership preferred.

Address No. 406, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ON SALE—One Station-Meter, to pass 1000 cubic feet per hour. Almost new. Will be sold cheap.

Apply to J. HALL, Gas-Works, St. Helen's, LANCS.

TO GAS COMPANIES AND CHEMISTS.

FIFTY tons Antrim Limestone for Sale (containing about 98 per cent. of carbonate of lime).

THE CHROME AND BICHROMATE COMPANY, LIMITED, 44, FINSBURY CIRCUS, E.C.

GAS PLANT FOR SALE, suitable for Small Works:—

Seventeen 4-inch and 3-inch H-Pipes.
Eighteen 15-inch Circular Mouthpieces.
A 6-inch Governor.
A Station-Meter, to pass 6000 cubic feet per hour.
Scrubber and Washer combined; very good.
Vertical Condenser; very good.
Seven 7-feet lengths, 12-inch D-shaped Hydraulic Main.
Two Gasholders, each capable of holding 15,000 cubic feet.

Apply to the ENGINEER, Phœnix Gas Company, GREENWICH.

GASHOLDER FOR SALE.

ONE Telescopic Gasholder, 70 feet by 20 feet, complete, with cast-iron tank, columns, girders, and inlet and outlet pipes, valves, &c., of modern construction. In first-class condition, and made by Messrs. Piggott and Co., of Birmingham.

To be seen at work at the Gas-Works, Birkenhead.
Cause of removal to make room for extensions.
To be sold a bargain, taken down, and re-erected ready for work.

For particulars, apply to Messrs. ASHMORE AND WHILE, STOCKTON-ON-TEES, or to view to Mr. CALLOW, Gas Engineer, BIRKENHEAD.

TO GASHOLDER MAKERS.

THE Buxton Local Board invite Tenders for a TELESCOPE GASHOLDER, 80 feet diameter, to be erected at their new works, Ashwood Dale, Buxton.

Plans and specifications may be seen at the Gas-Works, Buxton, and at the Offices of Mr. Henry Lyon, Engineer, Barton House, Deansgate, Manchester.

Tenders, endorsed "Gasholder," addressed to the Chairman, to be sent in on or before the 13th of November next.

The Board do not bind themselves to accept the lowest or any tender.

By order of the Board,
JOSIAH TAYLOR, Clerk.

Local Board Office, Buxton, Oct. 26, 1877.

MICHAEL & WILL'S GAS AND WATER SUPPLY.

This day is published, second edition, 8vo., 25s., cloth,

THE LAW RELATING TO GAS AND WATER: comprising the Rights and Duties, as well of Local Authorities as of Private Companies, in regard thereto, and including all Legislation to the close of the last Session of Parliament. Second Edition. By W. H. MICHAEL and J. SHIRESS WILL, of the Middle Temple, Esqs., Barristers-at-Law.

London: BUTTERWORTHS, 7, FLEET STREET, Her Majesty's Law Publishers.

NOTICE.

THE GAS & WATER COMPANIES DIRECTORY, 1878.

(GAS SECTION.)

The Editor will feel greatly obliged if Secretaries and Engineers would fill up, and return to him at once, the forms sent them, as the work is now going to press. If any have not received Forms, they will be forwarded immediately, on application to the Editor,

CHARLES W. HASTINGS,
8, BUCKINGHAM STREET, ADELPHI, LONDON, W.C.

E. & W. H. HALEY,

General Ironfounders and Makers
OF
CAST-IRON GAS AND WATER PIPES.

Sizes 1¼ to 15 inches.

LISTER HILLS FOUNDRY, BRADFORD, YORKSHIRE.

GAS PURIFICATION.

BAILES & HALLSWORTH,
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS,
BY THEIR
PATENT OXIDE OF IRON COMPOUND.

The material is in use at most of the principal Gas-Works in Yorkshire and elsewhere. It contains considerably less moisture than natural Oxide of Iron. It is much cheaper and more efficient as a purifying agent.

B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.

FOR SAMPLES AND TERMS, ADDRESS—
BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY, LEEDS.

B. GIBBONS, JUN.,

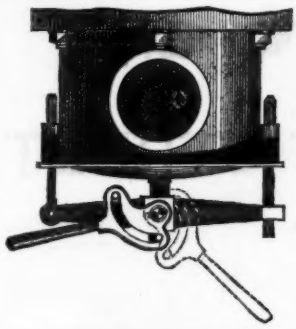
DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,
STOURBRIDGE (Established 1834),
MANUFACTURER OF EVERY DESCRIPTION OF
Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts.
A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.

GEORGE NEWTON,
UNION STREET WEST, OLDHAM,

MANUFACTURER OF
SQUARE STATION-METERS, with PLANED JOINTS;
ROUND STATION-METERS, WITH CAST-IRON STANDS;
WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.



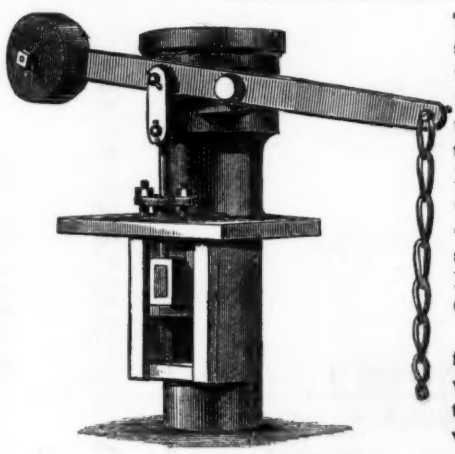
STORER & PUGH'S
PATENT
RETORT-LID FASTENINGS

Have now stood the test of experience, and have been found one of the greatest improvements in retort-house appliances yet invented. All who desire security and economy should give them a trial.

Prices and further particulars will be given on application to

J. STORER,
GAS-WORKS, STAFFORD.

MOORE'S PATENT DIP-PIPE.

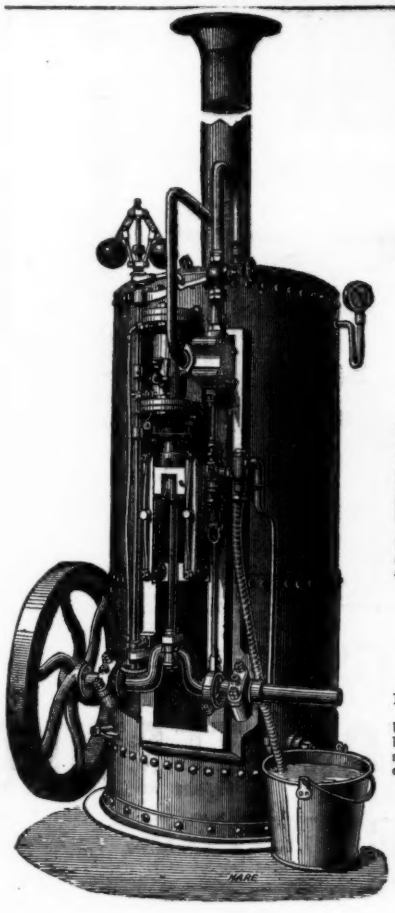


THE advantages of this Dip will be seen from the engraving. It is thoroughly effectual in its working, removing the whole of the pressure of the hydraulic main from the retort, thus causing a great saving in gas. It is very easy of manipulation, requiring little care and attention; it cannot get out of order, and, when shut, works as an ordinary Dip-Pipe. No accumulation of carbon in retort. Can be fixed to existing H-pipes.

In ordering the Dip, the distance from top side of hydraulic main to water-level should be stated; also the Dip at which it is required to work when the valve is shut.

PRICES—3-in., 35s.; 4-in., 42s.; 5-in., 48s.

SOLE AGENT: J. GILL, GAS-WORKS, BRIDGENORTH,
To whom all communications should be addressed.
MAKERS: THE COALBROOKDALE COMPANY, SHROPSHIRE.



HAYWARD TYLER & Co.'S
PATENT
COMBINED BOILER
AND
"UNIVERSAL"
STEAM PUMP

Forms an exceedingly compact arrangement, requiring no foundation.

TESTIMONIALS.

Gas Company's Office, Luton, Beds, Aug. 30, 1873.

MESSRS. HAYWARD TYLER & Co.
Gentlemen,—The 9-inch by 6-inch Steam Pump which I had from you worked in a most satisfactory manner, and perfectly answered the purpose for which it was required. I used it for emptying a gasholder-tank, and for refilling it with water. The quantity of water delivered was far beyond my expectations.
Steam was led into it from our Stationary Engine Boilers, through 1¼-inch wrought-iron pipe, a distance of about 90 feet; the whole occupied a fitter less than a day, and work commenced without loss of time.
Yours truly,
(Signed) W. PHILLIPS,
Engineer of Luton Gas Co.

Ratcliff Gaslight & Coke Co., New Crane, Wapping, London, July 25, 1872.

MESSRS. HAYWARD TYLER & Co.
Dear Sirs,—Have you one of your "Universal" 4-inch by 3-inch Steam Pumps in stock, and how soon could it be delivered? It is for pumping ammonia water, and should have cast-iron clacks. The one I have works capitally.—Yours, in haste,
(Signed) HY. E. JONES.
N.B.—Two more have since been supplied.

84, WHITECROSS STREET,
LONDON, E.C.

TO BUILDERS AND GASHOLDER MAKERS.

THE Belper Gas and Coke Company invite TENDERS for the construction of a GASHOLDER-TANK, at the Gas-Works in Belper, 51 ft. 6 in. diameter, and 16 ft. deep.
Also tenders for the erection of a TELESCOPE GASHOLDER, 50 ft. diameter, in two lifts, each 16 ft. deep.
Both Tank and Gasholder are to be constructed in accordance with plans and specifications, which can be seen at the Office of the Company, in Belper.
Tenders are to be sent in not later than the 12th of November next. If for both Tank and Gasholder, to be so marked ouside the letter; if for either Tank or Gasholder in separate tenders, same to be marked outside accordingly.
All tenders to be addressed to the Chairman, Gas Offices, Belper.
The Directors do not bind themselves to accept the lowest or any tender.
By order of the Directors,
SILAS SOWOOD, Manager of the Company.
Gas Offices, Belper, Oct. 12, 1877.

NOTICE.

MESSRS. THOMAS DOCWRA & SON, Contractors, Balls Pond Road, hereby give notice that they have no business connexion with any other person of the same name.

REMOVAL.

CHARLES HEISCH, F.C.S., Analytical and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has REMOVED from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

TO GAS ENGINEERS, MANAGERS, &c.

HILL and CO., Gas Engineers and Architects, 11, Appach Road, BRIXTON RISE, S.W., prepare Designs for the construction of New Gas-Works, Bridges, and Roofs, or for the remodelling and extension of existing Works. Also provide Drawings of all kinds of Gas Apparatus and Plant. Drawings, Tracings, and Specifications copied for Engineers and Contractors.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
5, NORFOLK STREET, MANCHESTER.

A. FAIRLIE WILSON,
CONSULTING GAS ENGINEER,
34, ST. GEORGE'S ROAD, SOUTHWARK, S.E.
Reports and Valuations in the Management, Construction, and Structural Value of Gas-Works.

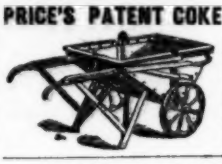
HENRY LYON,
ENGINEER,
AND
CONSULTING GAS ENGINEER,
BARTON HOUSE, opposite BARTON ARCADE,
DEANSGATE, MANCHESTER.

ALFRED LASS,
SPECIAL ACCOUNTANT FOR GAS COMPANIES,
30, GRACECHURCH STREET, LONDON.
Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.
The Forms of Account, which have been specially designed by A. L. to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.
The above forms are registered.
Water Companies Accounts also prepared and adjusted.
CONSULTATIONS.

CATHELS'S Patent Gas-Washer is an excellent cleanser of gas from tar, ammonia, sulphur, and carbonic acid, reducing the cost of subsequent purification 30 to 50 per cent. Needs no motive power or attention beyond drawing off and recharging as required. Has no moving parts or complications to get out of order. Is of moderate cost, and is practically indestructible.
Application to be made to the MANUFACTURERS, the Horsley Company, Tipton, STAFFORDSHIRE.

GARSIDE'S IMPROVED MAIN DRILLING CLIP.
No. 1 takes from 2-in. to 6-in. Mains.
No. 2 takes from 6-in. to 12-in. Mains.
GARSIDE'S REGISTERED TUBE-VICE takes ¾ brass to a 2-in. Socket.
May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
SCOTSWOOD-ON-TYNE.

THOMAS LAMBERT & SONS
MANUFACTURE EVERY DESCRIPTION OF
GAS AND WATER FITTINGS;
ALSO,
WROUGHT-IRON TUBES & FITTINGS.
SHORT STREET, LAMBETH, LONDON.

WILLIAM SUGG,

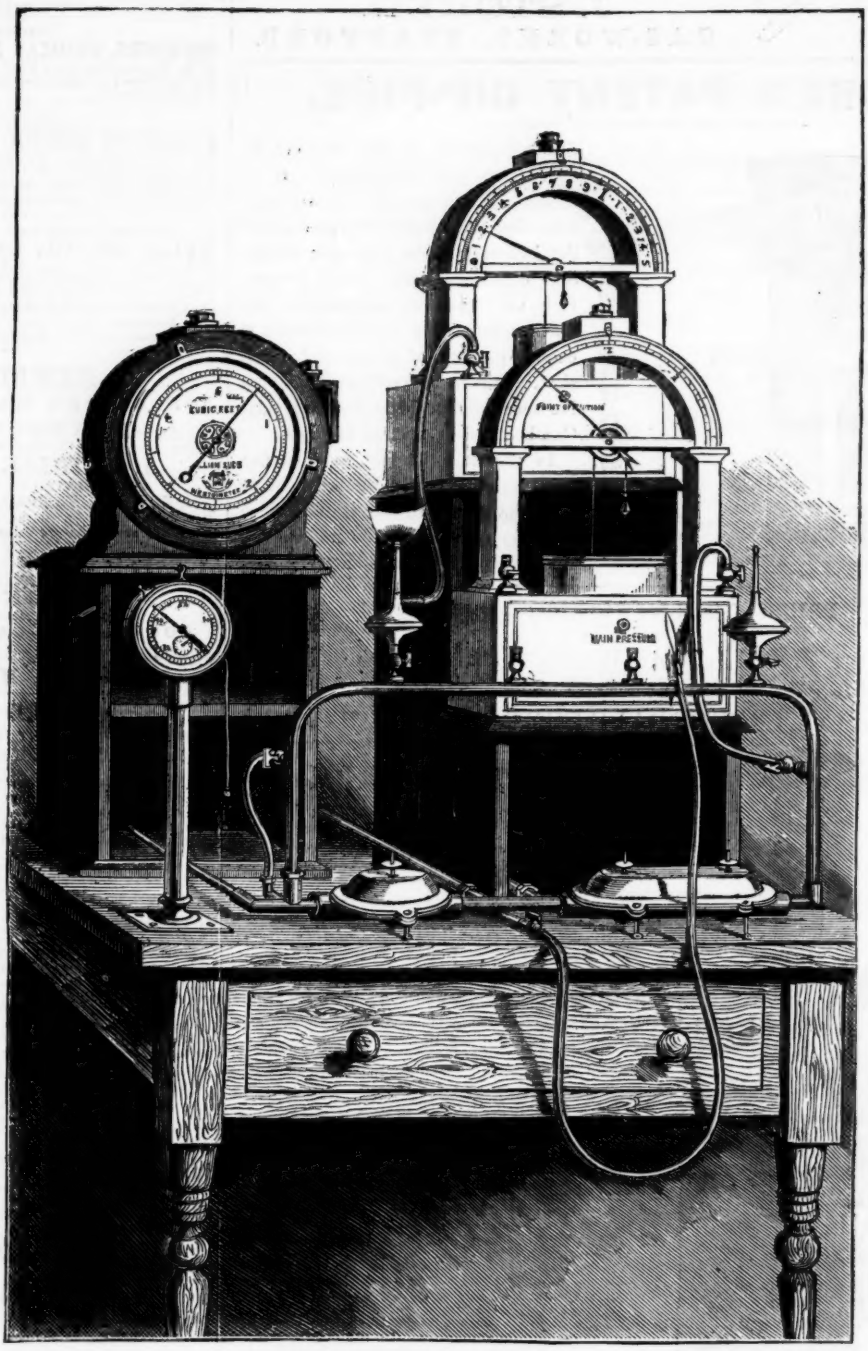
GAS ENGINEER,

VINCENT WORKS, VINCENT STREET,

WESTMINSTER, S.W.

SUGG'S IMPROVED PATENT STREET-LAMP METERS.
(KENSINGTON PATTERN.)

SUGG'S IMPROVED REGISTERED STREET-LAMP COLUMNS AND LANTERNS.
(SALFORD PATTERN.)



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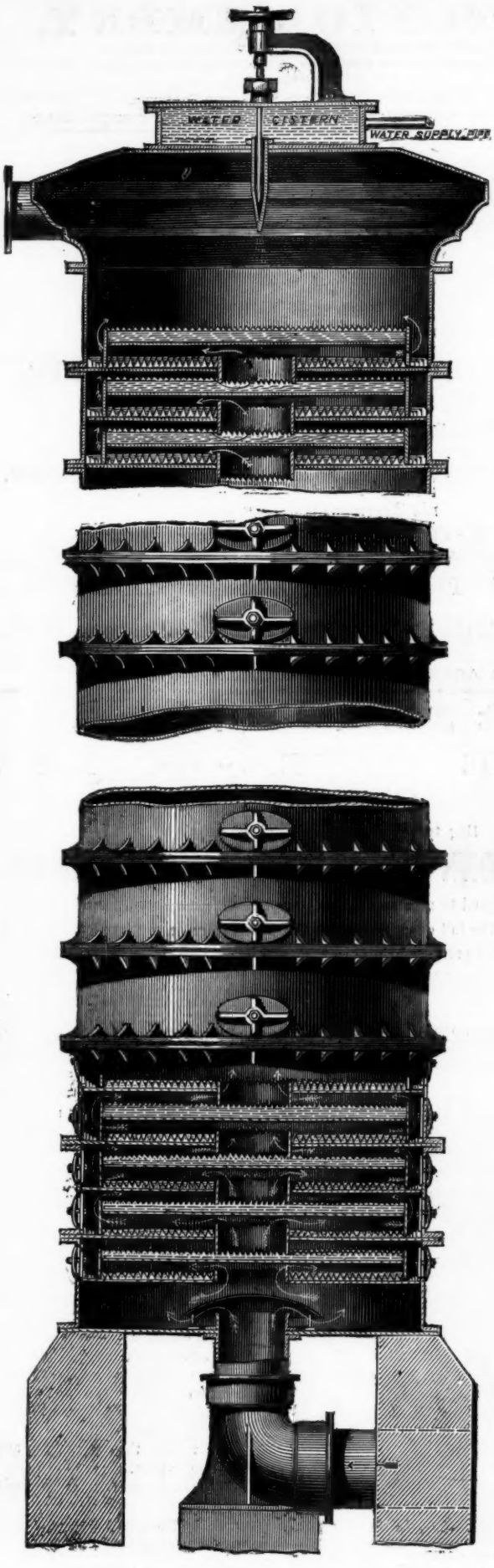
SUGG'S IMPROVED PATENT PUBLIC LAMP GOVERNORS.
(DOUBLE REGULATION.)

[ENTERED AT STATIONERS' HALL.]

WILLIAM SUGG'S
IMPROVED APPARATUS FOR TESTING
STREET-LAMP GOVERNORS.

PRICES COMPLETE, AS ABOVE, ON APPLICATION.



SAMUEL CUTLER & SONS

CONTRACTORS FOR GAS & WATER WORKS,
GENERAL ENGINEERS, IRONFOUNDERS;
AND
MANUFACTURERS OF

Gasholders, Tanks, Purifiers,

SCRUBBERS, VALVES, EXHAUSTERS,

IRON ROOFS,

BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORK.

S. C. & Sons undertake the entire Erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the Supplying and Laying of MAINS.

They make a speciality of supplying every requisite whatever for a Gas-Work, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

MANUFACTURERS OF

CUTLER'S PATENT GAS-WASHER

AND

MORRIS & CUTLER'S PATENT CONDENSER.

(For Illustration and Description, see "Journal" for Oct. 16, page 618.)

DESCRIPTION OF CUTLER'S PATENT GAS-WASHER.

The Washer consists of a vessel or tower of a cylindrical or other form, convenient to the site available for it. The interior is fitted with a number of dished trays arranged as shown, one above the other, from bottom to top. The flanges or sides of these trays are formed with serrated edges, and are arranged so that each tray contains a certain depth of water or liquor; the position and size of the serrated orifices in the dipping edges being such that the upper parts are slightly above the water, and so that the combined area of these small orifices is proportionate to the size of the inlet-pipe, the gas passing through without increase of pressure, and diffused in thinly divided streams. All the other edges are likewise serrated, so that the liquor passes over same in small streams, and so that the gas cannot pass through in bulk. The water or washing liquor is admitted at the top, the supply being governed by a conical needle regulating-valve so that the amount can be regulated to any desired quantity. The gas is admitted at the bottom and out at the top, the water or liquor descending the one meeting the other, and thus being brought into the very closest contact, and the gas consequently being deprived of its ammonia and other impurities absorbed by water or other liquor.

Where a slight increase of pressure is not of great consequence, we prefer to allow some of the lower tiers of trays to be slightly sealed, the better to arrest any tar or heavy oils that may have passed the condenser.

For further Particulars, apply to

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL,
(NEAR THE STEAMBOAT PIER,)
LONDON, E.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.
GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for Inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,
107, GOSWELL ROAD, LONDON, E.C.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH & BRIXHAM (TORBAY) DEVON.
OFFICES:
23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

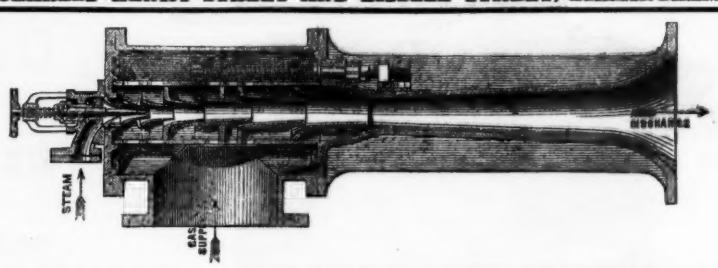
A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

For Jointing and Repairing Retorts and Ovens *in* action and *out* of action.
A Pamphlet on the advantages of the above, with modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, GAS AND HYDRAULIC ENGINEER,
CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.
IMPROVED CLELAND'S PATENT.
UPWARDS OF 250 IN USE.

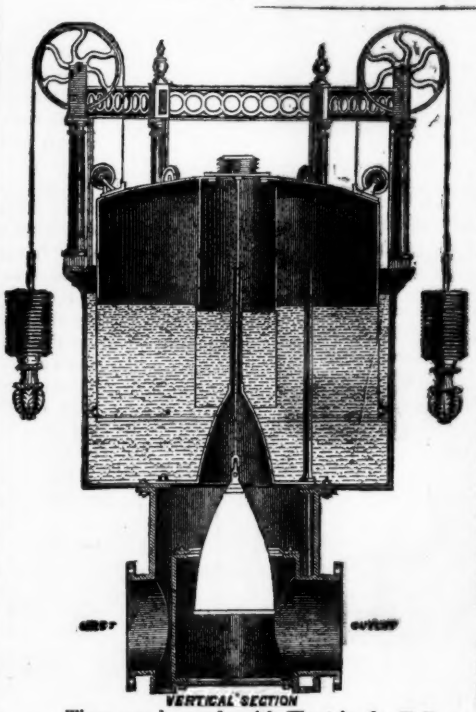
CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO
KÖRTING BROS.,
17, LANCASTER AVENUE, MANCHESTER,
OR TO
GERALD J. TUPP, 8, John Street, Adelphi, W.C.,
LONDON,
SOLE AGENT FOR ENGLAND AND WALES.

J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,

Beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. Sugg & Co., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

THE
IMPERIAL METER COMPANY,
LIMITED,
KING'S ROAD, LONDON, N.W.,
OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,
MANUFACTURERS OF
"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,
STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

Attention is called to their Dry Meters in Wood Cases, as used by the principal London Gas Companies. These Meters are especially suitable for seaport towns and for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

THE
SILBER LIGHT COMPANY, LIMITED,
49, WHITECROSS STREET, LONDON, E.C.
MANUFACTURERS OF SILBER GAS-BURNERS & FITTINGS.

No. 285.

The Times says: "A considerable improvement upon any burners of the same kind that have hitherto been constructed."

Dr. W. WALLACE, F.R.S.E., F.C.S., says: "After a careful study of the principles of the Argand, I have come to the conclusion that your burner is the best at present known."

The Silber Tubulated Gas-Burner.

No. 291.

The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

The *Lancet* says: "Mr. Silber has obtained a light of singular steadiness, whiteness, and illuminating power, with the great additional advantage of such perfect combustion as to preserve the purity of the atmosphere."

The manager of the gas-works at Southport says: "When our gas is 18 candles with the Standard burner, the Silber gives it as 22. You ought to get it noticed by the gas managers at once."

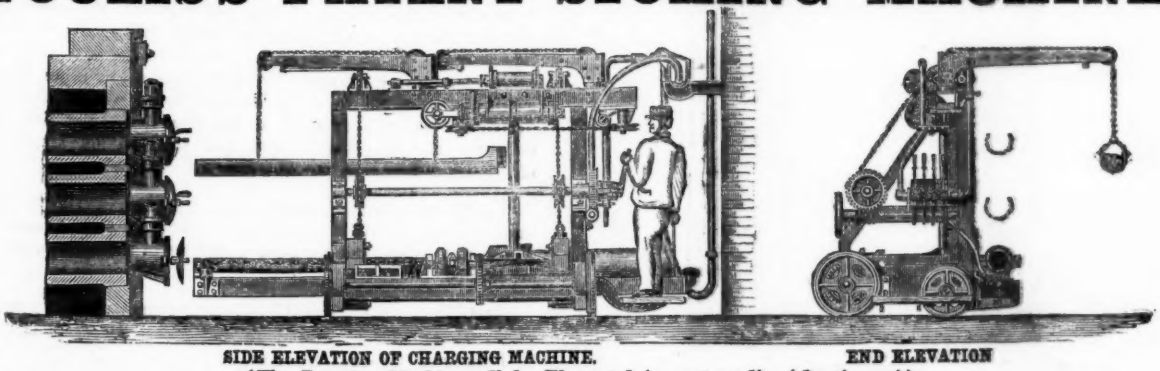
No. 286.

The Times says: "Besides the Argand burners, some improved Bat's-wing burners of different sizes were exhibited. In these there is an internal chamber permitting the expansion of the gas before it reaches the flame. They are constructed to burn from two to eight cubic feet of gas per hour, and the illumination they give ranges from 4 to 30 candles, a considerable improvement upon any burners of the same kind that have hitherto been constructed."

The Silber Bat's-wing Gas-Burner.

THE SILBER LIGHT COMPANY, LIMITED,
Are also Manufacturers of every description of Lamps for Railways, Ships, Streets, Churches, and Domestic Purposes.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION

(*The Drawing Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

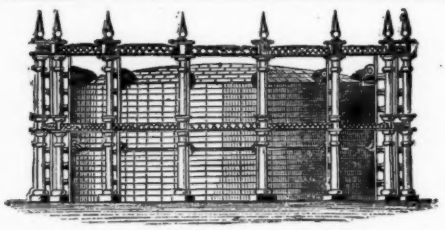
FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

SOLE AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.

NOTICE OF REMOVAL.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

Begs to intimate to his numerous connexion that, for the convenience of Gas Managers and others waiting upon him, he has removed from

89, HIGH STREET, STOURBRIDGE,

and that in future his HEAD OFFICES will be

123, NEW STREET, BIRMINGHAM,

Where all communications and inquiries should be addressed.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,594 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

TO GAS COMPANIES.

GEORGE M'KAIG,

MANUFACTURER OF

GAS-PURIFYING WOOD SIEVES,

153, CLEVELAND STREET,

DONCASTER.

It requires but one trial to prove the Superior Make, Strength, and Durability of these Sieves.

CARRIAGE PAID.

BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

MILES PLATTING, MANCHESTER.

BUYERS OF COAL TAR,

And Crude Products therefrom,

AMMONIACAL LIQUOR, &c.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD, LANCASHIRE.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

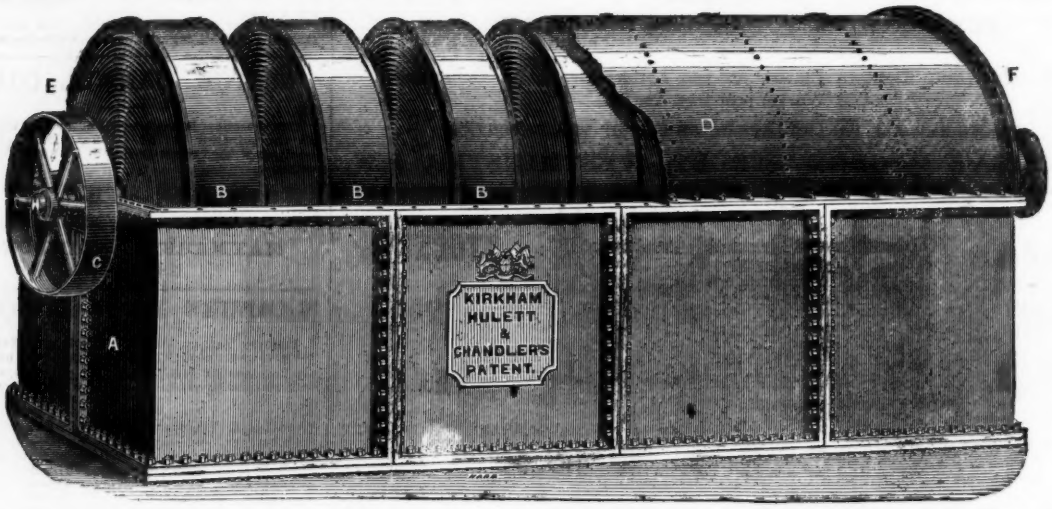
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

STANDARD WASHER AND SCRUBBER.



The advantages of the Apparatus will doubtless be understood by those interested in gas manufacture.

The principal points of any Apparatus for the extraction of ammonia may be summarily stated as follows:—

1. **A large amount of Surface is desirable.**
2. **Such Surface should be always effectually Wetted.**
3. **The Surfaces or Scrubbing Material should cause no Pressure.**
4. **The Gas should meet various strength Liquors on its course.**
5. **However small the quantity of Water used, it ought to operate over the whole Surface.**
6. **Changing Scrubbing Material is both Objectionable and Expensive.**
7. **Economy both as to Space occupied and Cost of Apparatus is an important item.**

All these requisitions are supplied by the above Apparatus, of which the following is an explanation:—

A is a cast-iron tank, formed into several separate water-tight compartments.

B B B volutes of sheet iron fitted to the centre shaft, which is driven by the pulley, C, and causing the said volutes to revolve each in a separate compartment filled with water or other fluid.

D, the cover, has partitions fitted into it corresponding with those in the tank, sufficient space being left between the top of the partition in the tank and the lower edge of that in the cover, to allow the gas a free passage through the first volute to the second, and so on to the third, fourth, &c.

The action is as follows:—The crude gas entering at E is partly washed in the first compartment, which becomes 10 or 12 oz. liquor, or stronger if required, according to the quantity allowed to enter per ton; the gas then passes to the second, where the liquor is of a less strength; thence into a weaker liquor, as it passes from one compartment to the other, finishing at the last compartment or outlet, F, with clean water, which is constantly flowing and running over from one compartment to another, until it reaches the last space, from which it flows from the outlet-pipe into the well or tank ready for sale or removal.

Taps are inserted in each compartment for the convenience of drawing liquor for testing, &c.

Applications as to Cost, &c., may be obtained of either

Mr. D. HULETT, 55 & 56, HIGH HOLBORN;

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER;

Or Messrs. CHANDLER, 104, NEWINGTON CAUSEWAY.

Inquirers will please state their Maximum Day Make.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. G. WARREN DRESSER, Editor.

Issued Semi-Monthly at No. 42 Pine Street, New York City.

This Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

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CELEBRATED SILKSTONE GAS COALS.

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